DGNB System

DGNB SYSTEM

NEW CONSTRUCTION, BUILDINGS CRITERIA SET

Version 2020 international

DGNB Global Benchmark for Sustainability

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Foreword



DEAR MEMBERS, AUDITORS, DESIGNERS, AND OTHER INTERESTED PARTIES,

We are pleased to present to you the new international version of our certification system for new buildings: truly a global benchmark for sustainability. It results from DGNB's many years of experience in certifying buildings, as well as from market trends and market requirements in terms of sustainability. It is also our answer to the global challenges we face today which are more urgent than ever before.

The purpose of the DGNB and the DGNB System is not to provide certification for certification's sake, solely as a marketing tool or to demonstrate leadership; instead, it uses certification as a means by which a consistent overall quality standard can be ensured. Of course this also entails transparent quality control by means of an independent, neutral certification process. The DGNB System is intended to be used both as motivation and as a planning tool, enabling demonstrably better buildings to be built and managed. Sustainability must be approached as an integral part of every building project rather than being an add-on or an optional consideration..

This version of the DGNB System has been developed after taking into consideration feedback and experiences from a wide range of market participants. Based on this, we have further developed the DGNB system so that it represents the DGNB's sustainability concept and defines it more clearly than ever before, allowing it to be used as a tool in planning and construction stages to help finding the right answers to the most pressing questions regarding how to make provisions for the future. This takes the form of the following key issues:

People as a focal point

We build for ourselves – the people who spend a large portion of their lives inside buildings. With this in mind, it almost goes without saying that people's health and happiness should be a focal point when making design and construction decisions. The DGNB has anchored this principle in its system from the very beginning. In the latest version, this fundamental principle is systematically expanded and further promoted. This includes, for example, casting a critical eye over the kinds of technology and equipment used in a building, and considering the disempowerment of users that could result if their requirements are ignored in the decision-making process. The self-determination and responsibility of the users is a necessary and fundamental factor in ensuring that building management is both effective and appropriate.

Circular economy

One of the DGNB's primary concerns is promoting the responsible use of resources. It is about the forward-looking selection of products in terms of their ingredients and in the context of their application, as well as the consideration of possible structural modifications during use. Also, to close the circle, dismantling the building at the end of its useful life should be considered when choosing products at the planning stage. For this version of our system, we have systematically developed this topic and anchored it more firmly in the system. Through its certification system, the DGNB is thus ensuring that material cycles are ready for later reuse or further use in accordance with the cradle-to-cradle philosophy - via new business models as well as responsible and forward-looking product development. This makes the DGNB System the first building certification system which consistently integrates circular economy and that over a wide variety of topics in order to make it assessable and measurable at building level. So to promote new approaches, these solutions are rewarded with appropriate incentives (in the form of bonus points), which have a positive effect on certification results.

Design quality

The DGNB considers design quality to be an integral part of sustainable building. For instance, we introduced the "DGNB Diamond Award" in 2016 – a way of evaluating over and above standard certification with regard to sustainability. This aspect is systematically further developed in this version of the DGNB System by focusing more closely on the contribution that the building and its outdoor space make in the context of urban planning. The criteria for site quality have therefore not only been revised, but will also be included directly in the certification results. Furthermore, greater emphasis has been placed on design aspects in order to foster a more integral, holistic approach to planning. This includes, for example, rewarding the architectural office winning the competition as well as the associated specialist planner team by continuous commissioning them. In addition, a new criterion with regard

to FM-compliant planning has been included in the process quality criteria, in order to take facility management aspects into account right from the design stage.

Sustainable Development Goals (SDGs)

With Sustainable Development Goals (SDGs) being the focus of the Agenda 2030, the United Nations set out a number of specific objectives in 2016 that described a pragmatic approach involving a long-term shift in the way we think to further develop our world, which in turn enables us to live in a more sustainable world. The DGNB supports these objectives and seeks to encourage a concrete step in the right direction through certification. In order to firmly establish the concept of sustainable building in compliance with the SDGs and make this process transparent, we have checked that all the criteria in this version fulfil the objectives of the UN, and have provided the necessary information so that this can be verified accordingly. As a result, every project that obtains DGNB certification will, in future, also be issued with a statement specifying the extent to which a project contributes to the realisation of the SDGs. This will also provide motivation to users and facility managers to act in accordance with these goals during the use and operation of a building. As an additional incentive, we award an "Agenda 2030 bonus" for selected criteria for projects that contribute to the UN sustainability goals.

Climate Protection

It will be the biggest challenge of our time to tackle the issues of the climate change by reaching the goals set by the Paris Agreement in 2015. Meanwhile, it is widely understood that buildings play a major role in this challenge by extensively reducing CO_2 emissions. Nevertheless, a systematic approach from governments is still lacking in most countries. For more than ten years now, the DGNB has been committed to voluntarily achieve above and beyond what it required by codes and regulations. During that time, buildings certified by the DGNB have become more and more ambitious in reducing their carbon emissions during construction and while in use. Therefore, it was a logical step to enhance the importance of the climate goals in the newest version of the DGNB certification by implementing a tailor-made bonus system that rewards better buildings. The bonuses are given to buildings which are designed to be at least carbon neutral, meaning they produce more energy than they consume during operation. With this, the DGNB is setting a clear signal to the market that every new building can be designed as a carbon neutral building in order to make a positive contribution towards reaching global and national climate goals.

Innovation

Sustainability has been, and still is, a key issue for the future. We can already see plenty of good examples of this when we look at today's buildings and urban districts. However, the DGNB plans to push this even further, with bold, new ideas. In light of this, a new method has been integrated into the criteria in this version of the system: Innovation areas. This has been added to many criteria and is intended to encourage designers to devise optimal solutions that most closely match the requirements of the project. The innovation areas now incorporated into these criteria are also intended to foster a design culture based on actively addressing the requirements of the specific building task and tailoring solutions to individual projects.

We consider the further developments and focal points outlined briefly in this international version of the DGNB System for New Buildings to be important stepping stones towards improving the quality of our man-made environment all around the world. Against the current backdrop of global challenges, it is increasingly important that issues surrounding sustainability, and in particular their practical implementation, are taken seriously. Verbal agreements and purely market-driven measures are no longer acceptable. We really do not have to accept this anymore, as we have instruments at our disposal, such as the DGNB System, that make action possible, with the power to do plenty of good. Its current version allows us to achieve more than ever.

At this point, we would like to thank all those who with their knowledge and volunteer commitment have contributed towards transferring the DGNB concept of sustainability into the next generation of the DGNB System. We would also like to thank the representatives of the DGNB Board of Directors, who are the driving force behind our unfailing commitment to making sure that the DGNB system continues to establish itself as an innovative and future-oriented planning tool. And of course, not forgetting the members of DGNB's technical committee for their enthusiasm and hard work on both the document production and quality assurance. In addition, we would like to thank all the other experts and auditors from the DGNB network who contributed their knowledge and their time to the production and review of this version of the system.

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HEAD OF RESEARCH AND DEVELOPMENT

How the criteria are structured

To make the DGNB System even more accessible, all the criteria have been restructured with the objective to make them clearer, easier to read and more user-friendly. The structure has been organised so as to more prominently feature the most relevant aspects for the project decision makers. The effects that result directly from addressing each criterion have been visually highlighted. A outlook is also given on how the DGNB will proceed in the future with regard to the criterion in question. More technical content on documentation as part of the certification process, that is primarily relevant for auditors, can be found in a separate document. The image below is an example drawn from various criteria.

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Environmental quality
ENV1.2 / LOCAL ENVIRONMENTAL IMPACT

Topic

Topic symbol

ENV1.2

Local environmental impact

Criterion: Code

People as a focal point

Criterion: Name

Objective

Our objective is to reduce, avoid or substitute all dangerous or damaging materials, (construction) products or preparations that can adversely affect or cause short, medium or long-term damage to people, flora and fauna.

What does the DGNB want to achieve with this criterion?

Benefits

The use of particularly environmentally friendly materials not only makes an important contribution to improving indoor air quality, but also helps limit the contamination risk of a building with regard to pollutants. Only a building elements catalogue, that is complete in terms of the environmental qualities of materials, can provide building owners with an extensive information about construction products used in various parts of the building. This information plays decisive importance for the quality assurance in the building construction, for clarifying deficiencies and finding appropriate ways for eliminating them, simultaneously optimising the costs of maintenance. This provides an important contribution to the value stability of a building.

What can the building owner and its users gain from implementing this criterion?

Contribution to overriding sustainability goals

How will implementing this criterion contribute towards achieving national and international sustainability goals?

	CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF THE UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant			12.1.a 12.2	Sustainable consumption Sustainable production
Moderate	3.4 3.9 12.4 13.2	Reduction of premature death, promotion of good health/well-being Effects of chemicals, air, water and soil contamination Environmentally friendly handling of chemicals and waste Climate protection measures in guidelines, strategies and planning	3.2.a 13.1.a	Air pollution Climate protection

Outlook

The handling and use of environmentally friendly materials is subject to increasingly strict regulatory specifications. Categorisation into quality levels is subject to changes in the long term. In addition beside the standard quality levels (QL), for this international version another quality level Zero (QL0) was developed, which is the minimum requirement for this criterion.

How will this criterion be further developed?

Share of total score

	SHARE	WEIGHTING FACTOR
Office Education Residential Hotel Consumer market Business premises Logistics Production	4.7%	4
Shopping centre	4.5%	4

Weighting of the criterion in the overall assessment

EVALUATION

How will the objective of the criterion be implemented using the indicators?

In order to maintain the diversity of ecosystems, indicator 1 provides information on identifying "biotope area quality". An Excel tool is available for calculating this. In order to foster diversity amongst animal species, measures implemented to support this in indicators 2 and 3 will be reflected positively in the assessment. Indicator 4 plays a key role in maintaining the genetic diversity of flora. If ecosystems are interlinked or facilitate the travel or migration of animals from one area to another, this can be made clear using indicator 5. Finally, fulfilling indicator 6, "Development and maintenance care", demonstrates that a long-term commitment to cultivating the area has been honoured. 110 points can be obtained for this criterion, of which a maximum of 100 points can be awarded for just fulfilling the criterion. The additional 10 points can be obtained by earning an "Agenda 2030 bonus". Including the bonus, a maximum of 110 points can be awarded for this criterion.

Tailored evaluation by means of a project-specific allocation to a points range

NO.	INDICATOR	POINTS
1	**Biotope area quality**	
1.1	**Biodiversity index**	**0–30**
	Property-specific biodiversity index = (total (sub-areas * specific biodiversity indices) * (floor space index) / (plot area))	
	■ Property-specific biodiversity index = 0.25	30
	■ Property-specific biodiversity index ≤ 0	0
1.2	**AGENDA 2030 BONUS – CLIMATE AND SPECIES PROTECTION GOALS**	**+10**
	Green surfaces on the building: Property-specific biodiversity index > 0.25 (for every 0.015 whole number above this figure +1 bonus point, max. bonus points = 10)	

Name of indicators plus any other specific information to note for evaluation purposes

How it appears for interpolation

Bonuses for overfulfilment

Use-specific evaluation

Shopping centre Business premises Logistics	**Max. 15**
■ Separate entrances for passenger cars and HGVs	+7.5
■ There are no restrictions on using the delivery zone and this does not affect ongoing operations	+7.5

How it appears when points can be added

3 Temperatures during the heating period	
3.1 Room temperature control during the heating period	
Office	**Max. 15**
■ Temperature can be adjusted in the room	8
■ Temperature can be individually adjusted by the users or user group (1 to 3 people)	15

How it appears when there are different options (either/or) to choose from

6 INNOVATION AREA	**As in 1.1–5.1**
Explanation: If user control means are implemented but cannot be assigned to any of the above categories or measures even though they demonstrably improve users' comfort or well-being, these can be credited in accordance with the evaluation scheme for indicators 1.1–5.1.	

Innovation area

Sustainability reporting

Appropriate key performance indicators (KPIs) include, in the case of positive evaluation of indicator 2, not using certain refrigerants for the communication or communicating selected relevant emission parameters for construction products used.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	No use of halogenated and partially halogenated refrigerants that are persistent by themselves or have persistent degradation products	[yes]
KPI 2	Emission profiles for construction products used, stating carcinogenic volatile organic compounds, formaldehyde and substances with LCI values (tested in accordance with CEN/TS 16516); corresponds to Level(s) indicator 4.1.2	[µg/m³], [-]

Building key performance indicators for sustainability reporting

Relationship between this criterion and other criteria in other DGNB schemes

Synergies with DGNB system applications

- **DGNB BUILDINGS IN USE:** The application of the criteria matrix can be proven in a procurement guideline for the ongoing maintenance in criterion ENV9.2 "Procurement" from the DGNB scheme for buildings in use
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion ENV1.2 from the scheme for renovated buildings.
- **DGNB INTERIORS:** High synergies with criterion ENV1.2 from the scheme for interiors.

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Process quality
PRO2.4 / USER COMMUNICATION
APPENDIX

The blue background is used (among other things) to denote all appendices

APPENDIX A – DETAILED DESCRIPTION

Appendix A: Contains additional explanations regarding relevance and a detailed description of the method

I. Relevance

User cooperation is incredibly important when it comes to ensuring that a building is sustainable. To this end, users must be provided with the necessary information and training.

II. Additional explanation

–

III. Method

Indicator 1: Sustainability guide
The building has a sustainability guide with specific recommended courses of action for the building users with regard to ecological, economic and social issues.

The medium of the guide may be chosen by the user themselves (e.g. paper, digital, regular newsletter, etc.). The crucial factor is that all regular users of the building have equal access to the information.

At a minimum, the guide includes information on the subjects of energy and water conservation, waste separation and healthy indoor climate.

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Process quality
PRO2.4 / USER COMMUNICATION
APPENDIX

Appendix B: Lists all the documentation required for certification

APPENDIX B – DOCUMENTATION

I. Required documentation

The following list depicts the possible forms of documentation. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1: Sustainability guide

- Confirmation of receipt, ideally by the user/tenant, or alternatively by the building owner, who has made a voluntary commitment to deliver this.

Appendix C: Contains information on any changes in the criterion and versions of the criterion

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

Note: only literature available in English language is mentioned in Appendix C for each criterion of the international version of the DGNB System. For further readings of criterion-specific German literature please refer to the German version of the DGNB System, Version 2018.

List of criteria that make people a focal point

CRITERION	CRITERION NAME	OBJECTIVE AND KEY MESSAGE
ENV1.2	**Local environmental impact**	Building users and people involved in the production, installation and disposal stages should not be exposed to elevated levels of pollutants or hazardous substances due to construction materials or products used in the building.
ENV1.3	**Sustainable resource extraction**	The raw materials required for the building should be extracted, produced and processed under minimum fair, humane social standards in all countries of origin.
ENV2.2	**Potable water demand and waste water volume**	Drinking water should be used sparingly and the use of rainwater or gray water should be increased in order to give everyone access to clean drinking water.
ECO2.1	**Flexibility and adaptability**	Building users should be able to adapt the building to their changing requirements with little effort.
SOC1.1	**Thermal comfort**	Room temperature and humidity in the building should be pleasant and comfortable to its occupants. People should not experience unpleasant draughts.
SOC1.2	**Indoor air quality**	Breathable air in rooms should be demonstrably clean and healthy, and should exhibit a good air exchange rate. Indoor air quality measurements are to be used to determine the air quality.
SOC1.3	**Acoustic comfort**	People in the building should experience a good acoustic quality in the rooms and should not experience excessive reverberation times when working, studying or undertaking other activities.
SOC1.4	**Visual comfort**	People should be able to make use of natural daylight in rooms without being blinded by glare; a good quality of artificial light sources should also be provided.
SOC1.5	**User control**	People should be able to adjust the room conditions, e.g. temperature and light, to suit their individual preferences.
SOC1.6	**Quality of indoor and outdoor spaces**	Building users should be provided with as wide a range as possible of different spaces, both indoors and outdoors, to improve their health and well-being and to promote social interaction.

SOC1.7	**Safety and security**	People should be allowed a high sense of security, for example to avoid being restricted in their own freedom of movement for fear of being attacked by other people.
SOC2.1	**Design for all**	All people should be able to use buildings equally regardless of their individual physical possibilities.
TEC1.2	**Sound insulation**	People in the building should not be affected by noise from outside, from neighbours or from building technology when working, learning or living.
TEC1.7	**Immissions control**	People should not be affected by light or noise from buildings or their use.
TEC3.1	**Mobility infrastructure**	Facilities should be provided to support the use of alternative forms of mobility to enhance people's health while making a positive contribution to the environment.
PRO1.5	**Documentation for sustainable management**	All relevant information must be provided to the owner, tenant and facility manager in a clearly organised format in order to ensuring that the building can be operated and optimised efficiently.
PRO1.6	**Urban planning and design procedure**	Efforts should be made – through good design and measures to integrate the building into its surroundings – to ensure that users of the building, as well other people in the neighbourhood, accept and appreciate this, and therefore enjoy using it for a long time to come.
PRO2.1	**Construction site/construction process**	By reducing the amount of noise and dust on the construction site, negative impacts on people can be minimised during the construction phase.
PRO2.4	**User communication**	The users of buildings should be informed about the quality of sustainability provided and the possibilities offered in order to optimise their individual influence on the real achievable performance during building operation.

SITE1.1	**Local environment**	Buildings should be designed to mitigate environmental risks in the local environment, in order to protect people in the event of extreme situations.
SITE1.2	**Influence on the district**	People should respond positively to buildings and their outer surfaces as an element of their environment and to identify positively with them.
SITE1.3	**Transport access**	People should be able to reach buildings easily according to their individual preferences and to use the widest possible variety of modes of transport.
SITE1.4	**Access to amenities**	Building's users should have easy access to a wide range of social and commercial infrastructure to optimally cater to their needs.

List of criteria involving innovation areas

CRITERION	CRITERION NAME	OBJECTIVE AND KEY MESSAGE
ENV1.1	**Building life cycle assessment**	Alternative approaches can be chosen and credited to allow the life cycle assessment method to be integrated and the building life cycle impact to be optimised.
ENV1.3	**Sustainable resource extraction**	Raw materials that have been extracted or produced responsibly or consist of secondary raw materials, but currently do not comply with the official requirements of the criterion, can be included in the evaluation as an alternative in agreement with the DGNB.
ECO1.1	**Life cycle cost**	Alternative approaches can be chosen and credited to allow the building life cycle costs to be optimised considering other methods at the design stage.
ECO2.1	**Flexibility and adaptability**	For the indicators "Building depth", "Vertical infra-structure", "Floor plan", "Structural design" and "Technical building services" alternative approaches that offer a high level of adaptability and flexibility can be recognised.
ECO2.2	**Commercial viability**	Alternative approaches can be recognised according to the context to solve target issues regarding the parking space situation. Alternative approaches that adequately address the existing market potential and risks can also be selected.
SOC1.2	**Indoor air quality**	If indoor air ventilation can be demonstrably improved by using alternative solutions, points can be awarded.
SOC1.5	**User control**	User control measures that cannot be assigned to any of the categories listed in the criterion (ventilation, sun/anti-glare protection, temperatures, controlling artificial light levels) or are not listed as examples of measures that might be taken but demonstrably improve the comfort or well-being of users can be credited as an alternative.

SOC1.6	**Quality of indoor and outdoor spaces**	If forward-thinking space concepts are employed that promote communication, meet users' needs and requirements and effectively accommodate the activities that take place in the building, these can be credited as an alternative to those described in the indicator "Indoor spaces to facilitate communication". The same applies to concepts that are both flexible and economically viable. Alternative solutions that go beyond those mentioned in the criterion, offer additional benefits to users or assist with the orientation and the provision of information can be credited as long as they are family-friendly or improve the quality of spaces in the building's access areas. Innovative individual solutions that make effective use of outdoor space or increase comfort and convenience for users can be credited as an alternative.
SOC1.7	**Safety and security**	Safety and security measures that cannot be assigned to any of the categories or measures listed in the criterion but demonstrably make people feel safer and protect them from assault can be credited as an alternative.
TEC1.4	**Use and integration of building technology**	If heat and cold distribution and transfer systems are not used and systems supplied entirely by renewable energy sources are used, the relevant indicators are considered fulfilled. Credit can be given for the use of energy storage devices and for ensuring that they are easily accessible. Points can also be awarded for easy accessibility when energy is transferred to rooms. The same applies to adaptability to future requirements.
TEC1.5	**Ease of cleaning building components**	If innovative solutions are devised that improve the ease of cleaning of the floorings, these can be credited as an alternative to the listed solutions.
TEC1.6	**Ease of recovery and recycling**	Measures that fall outside of the scope of building components to be considered as defined in the criterion or that currently do not fall within the definition of the quality levels but make recycling and demolition considerably easier can be credited as an alternative.

TEC3.1	**Mobility infrastructure**	Where measures are employed that demonstrably encourage the building's users to use environmentally friendly modes of transport (non-motorised forms of transport, public transport or rental systems) extensively and frequently to reach the building, these can be credited in accordance with the objectives of the criterion. This is also possible for electric vehicles (e.g. "green logistics", a concept that enables low-emission or zero-emission delivery services to be provided in town and city centres).
PRO2.1	**Construction site/construction process**	Innovative concepts, processes and technologies to significantly reduce noise and dust pollution which construction site workers and the environment are exposed to can be credited as an alternative.
PRO2.2	**Quality assurance of the construction**	Additional or alternative measurements and other quality assurance measures can be credited as an alternative if these are not required by law or by the authorities and are not common practice but provide documentary evidence of the high quality of the building or building components.
PRO2.3	**Systematic commissioning**	Instead of the indicators "preliminary functional testing", "functional testing and briefing" and "commissioning final report" required in the criterion, additional or alternative procedures can be permitted if they fulfil the same objectives as these indicators.
SITE1.2	**Influence on the district**	If a building gives an exceptional boost to the district or location that goes beyond the scope of the aspects defined in the indicator "Boost/attraction", this can also be credited. This can include, for example, architectural or civil engineering innovations.
SITE1.3	**Transport access**	If additional mobility elements such as shuttle bus, company bicycles or company public transport tickets are offered to building users, or other effective means of achieving the same objectives are placed at their disposal (e.g. district-based or company mobility management, car and bike sharing and their integration in the public transport network, innovative developments in the surrounding public transport network), these can be credited as an alternative.

List of criteria with circular economy bonuses

CRITERION	CRITERION NAME	CONTRIBUTION TO A CIRCULAR ECONOMY	SCORE
ENV2.3	**Land use**	Brownfield redevelopment: Land that is subject to low-level or significant contamination is considerably improved by **properly disposing of the soil and sediment** on the land.	CE bonus: +5 points (low-level contamination), +10 points (significant contamination)
ECO1.1	**Life cycle cost**	Reuse: It can be demonstrated that a significant proportion of **building components have been reused** in the building or used in line with business models based on the idea of a circular economy (e.g. performance contracting with a strategy for recycling or reuse).	Maximum CE bonus: +10 points, plus 5 bonus points for every circular economy solution implemented.
ECO2.1	**Flexibility and adaptability**	High intensity of use: In the building, area use concepts have been implemented for an area share of at least 50% of the usable area, which enable a **higher intensity of use** (through a higher number of users or different times of use).	CE bonus: +10 points
ECO2.2	**Commercial viability**	Circular economy users or tenants: At least one company/party actively contributes to a circular economy as **users/tenants** of the building. This occurs in the building itself or at the site by means of joint **material flow management** or similar forms of collaboration with another company/party within the near vicinity of the building.	CE bonus: +10 points

TEC1.4	**Use and integration of building technology**	District-level solution for renewable energy: To cover the energy demand in the building that arises from operation of the building and from user actions, energy that is generated in the surrounding **district**/in the immediate vicinity from **renewable** energy sources (at least 10% of the energy demand arising from operation of the building) is always used. Alternatively, energy that is generated in the building or on its site from renewable energy sources is fed to the district/the area in the immediate vicinity (at least 10% more than the energy requirements arising from the running of the building).	CE bonus: +10 points
TEC1.4	**Use and integration of building technology**	Energy system that provides ancillary services to the electrical grid: The building provides significant **storage capacity** (based on approx. 10% of the building's total energy requirements) for the purpose of **grid compatibility** or uses integrated energy and load management.	CE bonus: +10 points
TEC1.6	**Deconstruction and recycling**	Reuse or material recycling: **Building components are reused** in the building or are used, for which there is documentary evidence to show that **the materials they are made from are currently recycled** into comparable products.	Maximum CE bonus: +20 points (1 point per building component)
TEC1.6	**Deconstruction and recycling**	Eliminating building components: The building is designed so as to **completely eliminate building components** that are usually installed for this purpose. The solution presented is a feasible one that significantly and demonstrably eliminates the need to use raw or secondary materials.	Maximum CE bonus: +10 points (1 point per building component)
TEC3.1	**Mobility infrastructure**	Mobility sharing: The building has designated **mobility-sharing** parking spaces that are easily accessible or very near to the building's entrance. Alternatively, the building is located within an area in which a free-floating car-share service operates.	CE bonus: +10 points

PRO1.4	**Sustainability aspects in tender phase**	Recycling materials: The **invitations to tender** do not specifically forbid the use of mineral **recycling materials**; with regard to the building products, the reuse or use of secondary materials is however explicitly recommended or required by the invitations to tender.	CE bonus: +10 points
PRO2.1	**Construction site/construction process**	Waste prevention on the construction site: Innovative concepts, construction methods or technologies that significantly **reduce the amount of waste generated** are used in the **construction site**.	CE bonus: +10 points
SITE1.4	**Access to amenities**	Facilities that cater for people's day-to-day needs and provide meeting points for interaction: In or near the building, innovative **amenities or provisions** for the building's users or other people are built or provided, such as allotment gardens or beehives (urban farming), or spaces are provided on a permanent or regular basis for **trading skills or services with others in the community**, e.g. temporary trading spaces/pop-up shop premises, repair cafés, community meeting points.	CE bonus: +10 points

Please note:
The contribution made to a circular economy listed in the criterion ENV1.1, "Building life cycle assessment", through the provision of surplus energy or the reuse of building components is recorded using the indicator "Life cycle assessment comparative analysis" and is included in the evaluation. The contribution to a circular economy is thereby fully represented in this indicator.
The contribution made to a circular economy listed in the criterion ENV2.2, "Potable water demand and waste water volume", through the use of rainwater or greywater, resulting in a reduction in the consumption of drinking water and in the volume of waste water produced, is recorded when the key water performance indicator is determined and is included in the evaluation. The contribution to a circular economy is thereby fully implemented in this criterion.

List of criteria with Agenda 2030 bonuses

CRITERION	CRITERION NAME	CONTRIBUTION TO THE AGENDA 2030 OBJECTIVES	SCORE
ENV1.1	**Building life cycle assessment**	Climate-neutral operation (building): The CO_2 emissions generated as a result of the **energy demand arising from the building operation** are at least **offseted** in accordance with the DGNB definition for establishing climate neutrality*.	Agenda 2030 bonus: +10 points
ENV1.1	**Building life cycle assessment**	Climate-neutral operation (users): The CO_2 emissions generated as a result of the **energy consumption arising from the building users' activities** are at least **offseted** in accordance with the DGNB definition for establishing climate neutrality*.	Agenda 2030 bonus: +10 points
ENV1.1	**Building life cycle assessment**	Climate-neutral building construction: The total **CO2 emissions** (CO2 equivalents) from manufacturing and maintenance processes as well as end of life **that are bound in the building** and are determined by means of a DGNB life cycle assessment are at least **offseted***. (Life cycle scenario analysis).	Agenda 2030 bonus: +10 points (+5 points if the value is 50% less than the reference value)
ENV2.4	**Biodiversity**	Green surfaces on the building: **Planting greenery on additional surfaces on the building** increases the biotope area at site.	Maximum bonus: +10 points for a biodiversity index > 30
SOC1.1	**Thermal comfort**	Resilient thermal comfort: The frequencies of exceeding in the building's heating and cooling periods are calculated using predicted **future climate data for 2030 and 2050**. The results are used in the decision-making process at the planning stage.	Agenda 2030 bonus: +5 points
SOC1.2	**Indoor air quality**	Protection for non-smokers: **Measures implemented to protect non-smokers** help reduce premature death and promote good health.	Agenda 2030 bonus: +2.5 points
SOC1.2	**Indoor air quality**	Fine dust in indoor areas: **Measures implemented to eliminate fine**	Agenda 2030 bonus: +2.5 points

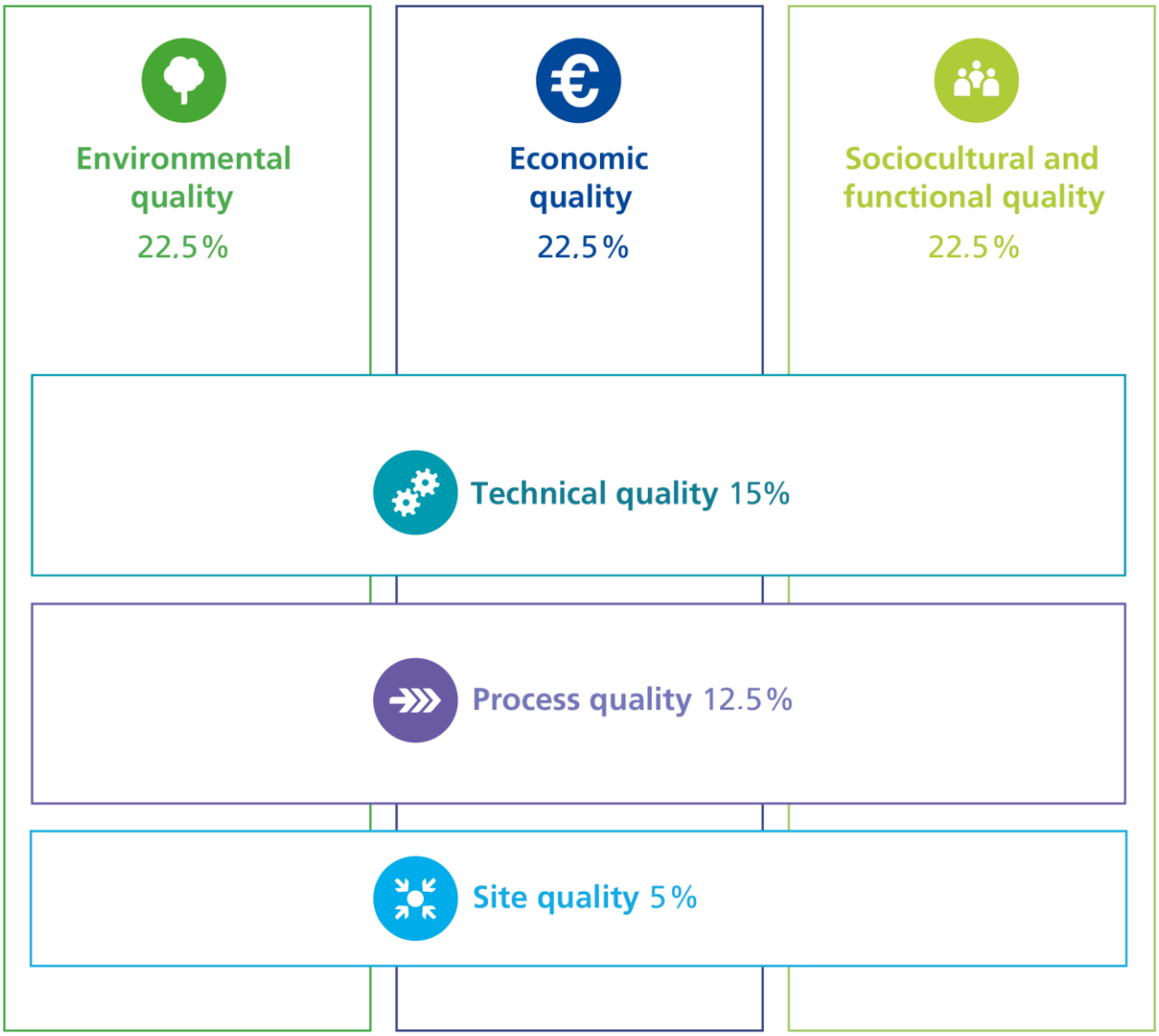
		dust in indoor areas help reduce premature death and promote good health.	
SOC1.3	**Acoustic comfort**	Noise reduction: All **measures for minimising noise** (as a factor that is harmful to health) listed in the criterion have been implemented and confirmed by measurements.	Agenda 2030 bonus: +10 points
TEC1.3	**Quality of the building envelope**	Resilient thermal comfort: The frequencies of exceeding in the building's heating and cooling periods are calculated using predicted **future climate data for 2030 and 2050**. The results are used in the decision-making process at the planning stage.	Agenda 2030 bonus: +5 points
TEC3.1	**Mobility infrastructure**	Vehicle to grid: Preparations are in place for the **bidirectional** charging and discharging of electric vehicles (**V2G – vehicle to grid**).	Agenda 2030 bonus: +10 points

* Please note: The definition of climate neutrality and the system boundaries of climate-neutral buildings can be found in the DGNB Framework for “carbon-neutral buildings and sites".

Evaluation and structure of the DGNB system

The following seven chapters provide an overview of the DGNB system as a whole. This includes the criteria and their weighting, the logic of the DGNB award as well as explanations of essential terms and applications of the DGNB system.

Basic structure of the DGNB System



The sustainability concept of the DGNB System has a broad scope and goes beyond the well-known "Three Pillars" model. It comprehensively covers all the fundamental aspects of a sustainable building. These encompass the following six topics: ecology, economy, sociocultural and functional aspects, technology, processes and site.The first three topics are weighted equally in the evaluation. This makes the DGNB System the only system to place equal importance on both the economic and the ecological criteria of a sustainable building. The qualities that fall outside of the scope of the "Three Pillars" model have an interdisciplinary function within the DGNB System and have different weightings. The scores attained in the assessment are always evaluated on the building's entire life cycle.

Overview of the criteria*

TOPIC	CRITERIA GROUP	CRITERIA NAME
ENVIRONMENTAL QUALITY (ENV)	EFFECTS ON THE GLOBAL AND LOCAL ENVIRONMENT (ENV1)	**ENV1.1** Building life cycle assessment
		ENV1.2 Local environmental impact
		ENV1.3 Sustainable resource extraction
	RESOURCE CONSUMPTION AND WASTE GENERATION (ENV2)	**ENV2.2** Potable water demand and waste water volume
		ENV2.3 Land use
		ENV2.4 Biodiversity at the site
ECONOMIC QUALITY (ECO)	LIFE CYCLE COSTS (ECO1)	**ECO1.1** Life cycle cost
	ECONOMIC DEVELOPMENT (ECO2)	**ECO2.1** Flexibility and adaptability
		ECO2.2 Commercial viability
SOCIOCULTURAL AND FUNCTIONAL QUALITY (SOC)	HEALTH, COMFORT AND USER SATISFACTION (SOC1)	**SOC1.1** Thermal comfort
		SOC1.2 Indoor air quality
		SOC1.3 Acoustic comfort
		SOC1.4 Visual comfort
		SOC1.5 User control
		SOC1.6 Quality of indoor and outdoor spaces
		SOC1.7 Safety and security
	FUNCTIONALITY (SOC2)	**SOC2.1** Design for all
TECHNICAL QUALITY (TEC)	TECHNICAL QUALITY (TEC1)	**TEC1.1** Fire safety
		TEC1.2 Sound insulation
		TEC1.3 Quality of the building envelope
		TEC1.4 Use and integration of building technology
		TEC1.5 Ease of cleaning building components
		TEC1.6 Ease of recovery and recycling
		TEC1.7 Immissions control
		TEC3.1 Mobility infrastructure

TOPIC	CRITERIA GROUP	CRITERIA NAME
PROCESS QUALITY (PRO)	PLANNING QUALITY (PRO1)	**PRO1.1** Comprehensive project brief
		PRO1.4 Sustainability aspects in tender phase
		PRO1.5 Documentation for sustainable management
		PRO1.6 Urban planning and design procedure
	CONSTRUCTION QUALITY ASSURANCE (PRO2)	**PRO2.1** Construction site/construction process
		PRO2.2 Quality assurance of the construction
		PRO2.3 Systematic commissioning
		PRO2.4 User communication
		PRO2.5 FM-compliant planning
SITE QUALITY (SITE)	SITE QUALITY (SITE1)	**SITE1.1** Local environment
		SITE1.2 Influence on the district
		SITE1.3 Transport access
		SITE1.4 Access to amenities

* All criteria must be considered as part of the certification process. If any of the criteria was not processed, certification cannot be awarded.

Please note:
The DGNB accepts no liability for the accuracy or applicability of this content to actual construction projects and strongly recommends that you consult a DGNB-certified auditor or consultant to ensure that it is correctly and successfully applied to projects in practice.

Weighting of the criteria

TOPIC	CRITERIA GROUP	CRITERION	OFFICE		EDUCATION		RESIDENTIAL		HOTEL		CONSUMER MARKET		SHOPPING CENTRE		DEPARTMENT STORE		LOGISTICS		PRODUCTION		ASSEMBLY BUILDINGS	
ENVIRONMENTAL QUALITY (ENV)	EFFECTS ON THE GLOBAL AND LOCAL ENVIRONMENT (ENV1)	**ENV1.1**	8	9.5%	8	9.5%	8	9.5%	8	9.5%	8	9.5%	8	9.0%	8	9.5%	8	9.5%	8	9.5%	6	7.5%
		ENV1.2	4	4.7%	4	4.7%	4	4.7%	4	4.7%	4	4.7%	4	4.5%	4	4.7%	4	4.7%	4	4.7%	4	5.0%
		ENV1.3	2	2.4%	2	2.4%	2	2.4%	2	2.4%	2	2.4%	2	2.3%	2	2.4%	2	2.4%	2	2.4%	2	2.5%
	RESOURCE CONSUMPTION AND WASTE GENERATION (ENV2)	**ENV2.2**	2	2.4%	2	2.4%	2	2.4%	2	2.4%	2	2.4%	2	2.3%	2	2.4%	2	2.4%	2	2.4%	2	2.5%
		ENV2.3	2	2.4%	2	2.4%	2	2.4%	2	2.4%	2	2.4%	3	3.4%	2	2.4%	2	2.4%	2	2.4%	3	3.8%
		ENV2.4	1	1.2%	1	1.2%	1	1.2%	1	1.2%	1	1.2%	1	1.1%	1	1.2%	1	1.2%	1	1.2%	1	1.3%
ECONOMIC QUALITY (ECO)	LIFE CYCLE COST (ECO1)	**ECO1.1**	4	10.0%	4	10.0%	4	10.0%	4	10.0%	4	10.0%	4	10.0%	4	10.0%	4	10.0%	4	12.9%	4	10.0%
	ECONOMIC DEVELOPMENT (ECO2)	**ECO2.1**	3	7.5%	3	7.5%	3	7.5%	3	7.5%	3	7.5%	3	7.5%	3	7.5%	3	7.5%	3	9.6%	3	7.5%
		ECO2.2	2	5.0%	2	5.0%	2	5.0%	2	5.0%	2	5.0%	2	5.0%	2	5.0%	2	5.0%	0	0%	2	5.0%
SOCIOCULTURAL AND FUNCTIONAL QUALITY (SOC)	HEALTH, COMFORT AND USER SATIS-FACTION (SOC1)	**SOC1.1**	4	4.1%	4	3.6%	4	4.3%	4	3.9%	4	4.5%	4	4.5%	4	4.5%	4	4.3%	4	4.3%	4	4.1%
		SOC1.2	5	5.1%	5	4.5%	5	5.4%	5	4.9%	4	4.5%	4	4.5%	4	4.5%	5	5.4%	5	5.4%	5	5.1%
		SOC1.3	2	2.0%	3	2.7%	0	0%	3	2.9%	0	0%	0	0%	0	0%	0	0%	0	0%	3	3.1%
		SOC1.4	3	3.1%	3	2.7%	3	3.2%	2	2.0%	3	3.4%	3	3.4%	3	3.4%	3	3.2%	3	3.2%	3	3.1%
		SOC1.5	2	2.0%	2	1.8%	2	2.1%	2	2.0%	2	2.3%	2	2.3%	2	2.3%	0	0%	0	0%	0	0%
		SOC1.6	2	2.0%	2	1.8%	2	2.1%	2	2.0%	2	2.3%	2	2.3%	2	2.3%	5	5.4%	5	5.4%	2	2.0%
		SOC1.7	1	1.0%	2	1.8%	1	1.1%	2	2.0%	1	1.1%	1	1.1%	1	1.1%	4	4.3%	4	4.3%	2	2.0%
	FUNCTIONA-LITY (SOC2)	**SOC2.1**	3	3.1%	4	3.6%	4	4.3%	3	2.9%	4	4.5%	4	4.5%	4	4.5%	0	0%	0	0%	3	3.1%

Relevance factor
Share of total score

TOPIC	CRITERIA GROUP	CRITERION	OFFICE		EDUCATION		RESIDENTIAL		HOTEL		CONSUMER MARKET		SHOPPING CENTRE		DEPARTMENT STORE		LOGISTICS		PRODUCTION		ASSEMBLY BUILDINGS	
TECHNICAL QUALITY (TEC)	TECHNICAL QUALITY (TEC1)	**TEC1.1**	4	2.5%	4	2.5%	4	2.5%	4	2.5%	4	2.9%	4	2.9%	4	2.9%	4	2.7%	4	2.7%	4	2.6%
		TEC1.2	3	1.9%	3	1.9%	3	1.9%	3	1.9%	0	0%	0	0%	0	0%	0	0%	0	0%	2	1.3%
		TEC1.3	4	2.5%	4	2.5%	4	2.5%	4	2.5%	3	2.1%	3	2.1%	3	2.1%	4	2.7%	4	2.7%	4	2.6%
		TEC1.4	3	1.9%	3	1.9%	3	1.9%	3	1.9%	3	2.1%	3	2.1%	3	2.1%	3	2.0%	3	2.0%	3	2.0%
		TEC1.5	2	1.3%	2	1.3%	2	1.3%	2	1.3%	2	1.4%	2	1.4%	2	1.4%	2	1.4%	2	1.4%	2	1.3%
		TEC1.6	4	2.5%	4	2.5%	4	2.5%	4	2.5%	4	2.9%	4	2.9%	4	2.9%	4	2.7%	4	2.7%	4	2.6%
		TEC1.7	1	0.6%	1	0.6%	1	0.6%	1	0.6%	2	1.4%	2	1.4%	2	1.4%	2	1.4%	2	1.4%	1	0.7%
		TEC3.1	3	1.9%	3	1.9%	3	1.9%	3	1.9%	3	2.1%	3	2.1%	3	2.1%	3	2.0%	3	2.0%	3	2.0%
PROCESS QUALITY (PRO)	PLANNING QUALITY (PRO1)	**PRO1.1**	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%
		PRO1.4	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%
		PRO1.5	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%
		PRO1.6	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%
	CONSTRUC-TION QUALITY ASSURANCE (PRO2)	**PRO2.1**	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%
		PRO2.2	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%
		PRO2.3	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%	3	1.6%
		PRO2.4	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%
		PRO2.5	1	0.5%	1	0.5%	1	0.5%	1	0.5%	1	0.5%	1	0.5%	1	0.5%	1	0.5%	1	0.5%	1	0.5%
SITE QUALITY (SITE)	SITE QUALITY (SITE1)	**SITE1.1**	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%
		SITE1.2	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%
		SITE1.3	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%	2	1.1%
		SITE1.4	3	1.7%	3	1.7%	3	1.7%	3	1.7%	3	1.7%	3	1.7%	3	1.7%	3	1.7%	3	1.7%	3	1.7%

Relevance factor
Share of total score

The DGNB logic of the award

	Platinum	Gold	Silver	Bronze*
Total Performance Index	≥ 80%	≥ 65%	≥ 50%	≥ 35%
Min. Performance Index	65%	50%	35%	-- %

* this award is only valid for the passed certificate or for the certificate "Buildings in operation".

Figure 1: The DGNB award allocation principles

The DGNB System uses performance indices to grade buildings. The total performance index is calculated using all six topics, taking their individual weighting into account. The platinum certificate is the most prestigious award issued by the DGNB.

Total performance indices of 50% or more earn the building DGNB Silver certificate. Total performance indices of 65% or more are awarded a DGNB Gold certificate. To merit a DGNB Platinum certificate, the project must be awarded a total performance index of at least 80%.

The DGNB is committed to encouraging high quality standards in every aspect of a building. This is why the certificate awarded is not based on the total performance index alone. In order to obtain a particular award, a certain minimum performance index must be achieved in each of the relevant topics (with the exception of "site quality"). For example, to obtain a platinum certificate, a performance index of no less than 65% for each topic is required. For a gold certificate a performance index of no less than 50% for each topic is required. For a silver certificate, the threshold is 35% for each topic.

DGNB pre-certificate

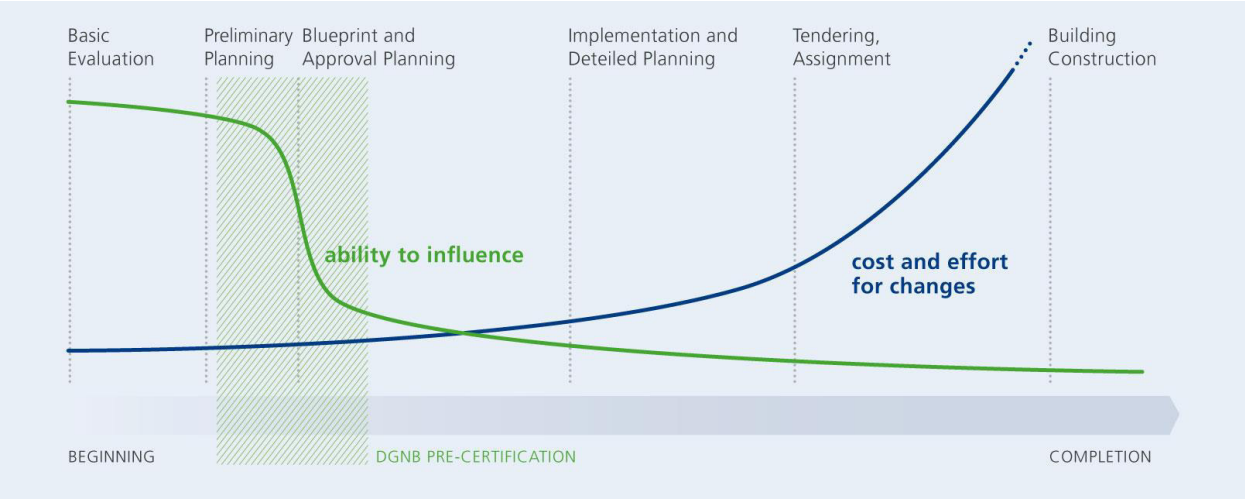


Figure 2: cost / effort / time ratio chart

One of the DGNB's objectives is to lay the foundations for certification at an early stage of the design process. A joint application for both the pre-certificate and the certificate is submitted, and an agreement with a rate of charges is drawn up based on this. There is the possibility to submit selected criteria for final consideration as early as the pre-certificate stage, and have the DGNB conduct their final assessment for the certificate on the basis of these.

The current scale of charges and more detailed information on the pre-certificate can be found on the DGNB website.

General principles

The general principles for applying the DGNB System are explained below. For further information, please refer to the DGNB Guideline for Certification (working title).

Definitions

The DGNB design area is the area considered for the classification of a project within a specific scheme or more than one (mixed use) and for identifying the primary use and other secondary uses in a building.
This area is defined as follows:

$$A_{DGNB} = UA - VA + CS \quad (1)$$

with:

A_{DGNB}	DGNB design area [m²]
UA	Usable floor area [m²] [T&D_04]
VA	Vehicle parking area [m²] [T&D_04]
CS	Circulation space in corridors and halls [m²] [T&D_04]

Primary use
The scheme with the largest proportion of the overall DGNB design area is referred to as "primary use". If the building is **mixed use**, then the scheme occupying the largest area is referred to as “primary use”. If assignment to one main category is not clear-cut (e.g. 40% **office**, 40% **residential**, 20% **department stores**), the primary use must be decided by the auditor, who should justify his decision.

Secondary use with an area >= 15% of the DGNB design area
One or more uses that are categorised under a scheme other than the primary use and that occupy **≥ 15%** of the DGNB design area are referred to as "secondary use". The areas designated to a secondary use must be assessed using the corresponding scheme. Buildings with primary and secondary uses (any secondary uses ≥ 30% of the overall DGNB design area) must comply with the application rules for **mixed use**.

Secondary use with an area < 15% of the DGNB design area (sub-use)
One or more uses that are categorised under a scheme other than the primary use and that occupy < 15% of the DGNB design area (or a total of < 30% if there are multiple uses) are referred to as "sub-use". These areas must be allocated to the primary use and assessed in accordance with the primary use scheme**.**
If there are multiple sub-uses that occupy ≥ 30% of the DGNB design area in total, the sub-use occupying the largest area is considered as the secondary use.

If the areas occupied by the sub-use are ≥ 400 m² or ≥ 10% of the DGNB design area, documentary evidence must be provided for indicator 1 in criterion "SOC1.2 – Indoor air quality" and criterion "SOC2.1 – Design for all" that the minimum requirement has been met in each case. When individual regulations for sub-use exist, these are listed in the relevant scheme in the section entitled "Scheme-specific information".

Certifiability according to the building's completion status

As a general rule, a building must be completed when the documentary evidence is submitted to the DGNB for conformity assessment.
Fittings are the only exception to this rule. A room is considered to be completed for the purposes of DGNB certification when the enclosing faces (walls, ceilings, floors, etc.) have finished surfaces (paint, floor coverings, etc.) and at least basic lighting has been installed.

1. The following must be completed:
    a. All circulation spaces CS ([T&D_04]
    b. All vehicle parking areas (usable area 7 - UA 7) ([T&D_04]
    c. Outdoor areas that are located within the system boundary and are to be included in the DGNB certification.
    d. The fittings in at least 80% of the DGNB design area.

2. In contrast to 1d, if there are tenant obligations in place for the remaining areas, it is considered completed when there are fittings in at least 25% of the DGNB design area. The completed areas and areas covered by tenant obligations,for which documentary evidence of this is provided, must occupy at least 80% of the DGNB design area.

3. In contrast to 1d and similar to 2, for primary and secondary uses in mixed-use buildings, it is considered completed when there are fittings on at least 25% of the DGNB design area (on a proportional basis) if there are tenant obligations in place for the remaining areas. The completed areas and areas covered by tenant obligations, for which documentary evidence of this is provided, must occupy a total of at least 80% of the DGNB design area.

4. As an alternative to points 2 and 3, an option is available to have a building that is ready for interior finishing certified. The "Ready for Interior Finishing" DGNB certificate (working title) can be used to certify buildings for which a firm decision has yet to be made with regard to some or all of the fittings for which the tenant is responsible. In order to receive this certificate, the common areas must be completed; these must be proportionally assessed in addition to the rented areas in which interior finishing work has already been completed. Incomplete finishing work will be reflected in the certification result. It is possible to have the building evaluated subsequently once further interior finishing work has been completed, e.g. by means of interior certification. An overview of the criteria to be assessed for the "Ready for Interior Finishing" DGNB certificate (working title) can be found on the DGNB website.

System boundary and minimum requirements

Unless otherwise specified in the individual criteria, only the building and open spaces directly allocated to it are taken into consideration for the assessment. Some criteria stipulate or allow for the assessment of outdoor areas.
The building will be primarily used in accordance with its scheme.
In addition, the following DGNB minimum requirements apply:

1. Indoor air quality (minimum requirements in accordance with SOC1.2 criterion)
2. Design for all (minimum requirements in accordance with SOC2.1 criterion)
3. Fire safety (minimum requirements in accordance with TEC1.1 criterion)
4. Statutory requirements: The statutory requirements that apply to the building to be certified must be fulfilled.

Where individual regulations with regard to minimum requirements exist, these are listed in this document in the section titled "Scheme-specific information".

Current validity of expert reports, analyses and simulations:

Expert reports, analyses and simulations must make reference to the current planning status or the building as it was actually constructed. If expert reports and simulations made reference to a previous planning status, evidence must be provided to clearly demonstrate that they continue to be valid and relevant.

Required documentation that must be submitted for the project (certificates)

The required documentation must be produced in accordance with the requirements described in the criteria. Alternatively, the following forms of documentation can be provided:

Alternative evidence

The requirements of the criterion/indicator remain unchanged.
The criteria specify the required or permissible forms of documentation. The evidence can be provided in another form as long as it clearly demonstrates that the objective of the criterion/indicator has been achieved. Before submitting documentary evidence in an alternative form, the proposed alternative form must be agreed with the DGNB certification body. The decision lies with the DGNB certification body.

Documentation for innovation areas (to replace "Individual project solutions")

If a criterion for an indicator allows for an alternative solution in the form of an innovation area, the indicator in question can be fulfilled by this solution. This enables the objective of a criterion/indicator to be fulfilled by a quality of the building that has previously not been described in this way in the criterion/indicator. Before submitting documentary evidence in an alternative form, the proposed alternative form must be agreed with the DGNB certification body. The decision lies with the DGNB certification body.

Simplified means of providing documentary evidence

Instead of the required documentation, documentation for some criteria can be supplied using a documentation template (can be downloaded from the internal section of the DGNB website). The template must be signed by the people named on the template. By signing the document, the signatories confirm that the requirements listed in the criterion have been fulfilled. The DGNB reserves the right to request individual pieces of documentary evidence on a random basis at a later date as part of the conformity assessment.

Evaluation points

The DGNB has defined target values for every criterion. To fulfil the objectives, evaluation points are awarded in each case. Depending on their scheme, some criteria are weighted differently based on how essential they are to the scheme in question.

Key to how the evaluation is presented

The maximum number of evaluation points that can be obtained is specified for each indicator; as illustrated below, the scoring appears differently depending on whether points can be awarded using interpolation, whether points can be added or whether there are different options to choose from:

How it appears for interpolation:

Biotope area quality	
Biodiversity index	**0–30**
Property-specific biodiversity index = (total (sub-areas * specific biodiversity indices) * (floor space index) / (plot area))	
▪ Property-specific biodiversity index = 0,25	30
▪ Property-specific biodiversity index ≤ 0	0

How it appears when there are different options to choose from (either/or):

Temperatures during the heating period	
Room temperature control during the heating period	
Office	**Max. 15**
▪ Temperature can be adjusted in the room	8
▪ Temperature can be individually adjusted by the users or user group (1 to 3 people)	15

How it appears when points can be added:

Parking space situation	
Delivery zone	
Shopping centre **Department stores** **Logistics**	**Max. 15**
▪ Separate entrances for passenger cars and HGVs	+7.5
▪ There are no restrictions on using the delivery zone and this does not affect ongoing operations	+7.5

Overfulfilment of a criterion due to bonuses

For some criteria, it is possible to obtain additional points due to circular economy bonuses or Agenda 2030 bonuses, meaning that the number of points awarded could exceed the maximum number of points for that particular criterion. These additional points can only be credited within a main criteria group/topic and cannot be transferred to other qualities. The foreword provides an overview of all the available bonuses.

Scheme-specific information

The primary use of each of the schemes is defined below.

Office

Offices are any building that is used primarily for office and administrative activities (UA 2 – Office space [T&D_04])

Education

This scheme encompasses all educational buildings, such as:

a. General education schools
b. Vocational schools
c. Special needs schools
d. Further education and training institutions
e. Kindergartens

The primary use of these buildings is rooms for education, training, seminars, lectures, workshops and classrooms. Secondary uses in the building being assessed, such as offices, kitchen, dining hall, laboratory, library, gym, etc., are assessed within the same scope. Separate buildings such as sports halls, libraries, canteens, etc. are excluded from this.

Individual regulations for secondary use:
If the areas occupied by the secondary use are ≥ 200 m² or ≥ 10% of the DGNB design area, documentary evidence must be provided for indicator 1 in criterion "SOC1.2 – Indoor air quality" and criterion "SOC2.1 – Design for all" to demonstrate that the minimum requirement has been met in each case.

Residential

Residential buildings are any building that is used primarily for residential purposes.
This scheme applies to multiple-family dwellings with > 6 accommodation units. It can be applied to boarding schools, halls of residence and nursing homes in agreement with the DGNB office.
For buildings with ≤ 6 accommodation units, there is the "New buildings: small residential buildings" scheme.

Individual regulations for secondary use:
If the areas occupied by the secondary use are ≥ 200 m² or ≥ 10% of the DGNB design area, documentary evidence must be provided for indicator 1 in criterion "SOC1.2 – Indoor air quality" and criterion "SOC2.1 – Design for all" that the minimum requirement has been met in each case.

Retail buildings: **Consumer market** **Shopping centre** **Department stores**

Retail buildings are buildings used for selling of goods and do not host any significant processing or production activities on site.

Consumer market

Extensive sales area for one or more users. Partial product assortment or full product assortment (from 800 m²). The entire building is assessed, including the interior finishing (costs of structural components - construction works and costs of technical components - installations[T&D_05])).
The DGNB defines the following as consumer markets:
Supermarkets, discount stores and specialist retail stores (e.g. drugstores, building supplies stores, etc.).

Shopping centre

Shopping centres are large facilities built on the basis of a central planning concept and cater for short-, medium- and long-term demand. A large number of retail outlets, food outlets and service businesses of varying sizes are densely packed in one area and the facility is centrally managed. The system takes into consideration the central infrastructure, utility and business operation areas with interior finishing (costs of structural components - construction works and costs of technical components - installations [T&D_05]) and some of the tenant fit out.
Shopping centres are distinguished from department stores in that shopping centre owners do not trade on their own but act only in the capacity of landlord and centre management. Department store owners, on the other hand, generally combine trading on their own with managing the property.

Department stores

The scheme Department stores encompasses a retail establishment that sells a wide variety of goods. These usually include ready-to-wear apparel and accessories for adults and children, yard goods and household textiles, small household wares, furniture, electrical appliances and accessories, and, often, food. A department store has several departments housed under the same roof to facilitate buying, customer service, and merchandising.

Department stores can include general areas such as customer toilet facilities, car parks and staff rooms for the employees working in the rented trading spaces. In contrast to shopping centres, department stores do not have a central shopping street. This set of criteria is based on the criteria set for shopping centres. The system takes into consideration the central infrastructure, utility and business operation areas with interior finishing (costs of structural components - construction works and costs of technical components - installations [T&D_05] and some of the tenant fit out.

Industrial buildings: Logistics Production

Logistics

Logistics buildings are defined as buildings used in the distribution and delivery of goods. This scheme is also used to certify high-bay warehouses.

Scope:
If the usable floor area for permanent workspaces is more than 400 m², or if there are more than 20 permanent workspaces in the building, the indicators for the share occupied by offices must also be assessed in criteria SOC1.1 and SOC1.4.

Individual regulations for secondary use:
If the areas occupied by the secondary use are ≥ 10% of the DGNB design area, documentary evidence must be provided for indicator 1 in both criterion "SOC1.2 – Indoor air quality" and criterion "SOC2.1 – Design for all" to demonstrate that the minimum requirement has been met in each case.

Production

Production buildings are any building in which merchandise or consumer goods are manufactured from raw materials or primary products using energy, labour, etc.

Individual regulations for secondary use:
If the areas occupied by the secondary use are ≥ 10% of the DGNB design area, documentary evidence must be provided for indicator 1 in both criterion "SOC1.2 – Indoor air quality" and criterion "SOC2.1 – Design for all" to demonstrate that the minimum requirement has been met in each case.

Hotel

Hotel buildings are any building that provides the main range of services offered by hotels. These include, for example:

1. Accommodation service (lodging/reception): Includes reception, housekeeping and reservation
2. Food and beverages (F&B): Kitchen, restaurant, bar, room service and catering service
3. Logistics: Purchasing office, goods inspection, storage
4. Administration: A combination of management, bookkeeping/accounting, controlling, secretarial staff, marketing/sales, HR department and workshops/maintenance.
5. Additional services: e.g. telephone/fax, internet connection, television, laundry service, fitness and wellness facilities, conference room rental, entertainment programmes

The main function of a hotel varies from hotel to hotel: They can be health resorts and wellness hotels (spa), holiday or sports hotels, or business, conference and seminar hotels.

Accommodation in the hospitality industry that does not fall under the definition of a hotel is any facility that does not offer all of the main range of services offered by hotels. This includes, in particular, B&Bs, guest houses, inns, hostels, halls of residence, serviced or self-catering accommodation such as apartments, shelters, lodges and chalets, campsites, holiday houses and flats, youth hostels, Friends of Nature guest houses, dormitories and villas, and any other types of accommodation available for rental.

Resorts are in a separate category, which is not covered by the 2020 version.

Assembly buildings

The scheme “Assembly buildings” are structures or parts of structures that are intended for the simultaneous presence of many people at events, in particular educational, economic, sociable, cultural, artistic, political, sporting or entertaining, as well as bars and restaurants. This scheme is to be applied to all buildings or parts of buildings that fall under the respective regulations for Assembly buildings in accordance with the building regulation codes or the state regulations on the construction and operation of “Assembly buildings” (if defined by the local building code, alternatively scheme can be defined via PCQ - “General certification inquiry”). This usually includes buildings with (assembly) rooms for more than 200 people or buildings that can accommodate more than 200 visitors, whereby the (assembly) rooms have common escape routes (with the exception of schools and laboratories).

Under the scheme “Assembly buildings”, the following building type can be considered:

- Congress building;
- Fair and city halls;
- Theaters and concert halls;
- Museums;
- Cultural, civic centers and libraries;
- Certification is generally also possible for “Assembly buildings” that are not listed above. Communication with the DGNB office regarding the scheme specific / project specific questions via the PCQ format is essential.

Note: In some criteria, the above-mentioned building types are summarized in the different categories. This varies from criterion to criterion according to Appendix 1. If it is not possible to clearly assign the building to certain type or different assignment makes sense due to special features, it is advisable to communicate with the DGNB office.

Other “Assembly buildings”, not listed above can be also certified. Coordination with the DGNB with regard to the assignment to a building type is also recommended here.

Project-specific flexibility

Variable indicators within criteria

In the scheme, there is the option of treating an indicator that is marked as “variable” as an “irrelevant” indicator. Such an indicator does not have to be processed for the project certification if irrelevance of content of an indicator can be proved. The "not relevant" indicator then does not have to be processed. A reason why the indicator is "not relevant" must be attached to the submission documents.

Variable indicators enable a better mapping of the actual events in the project. This changes the weighting of the remaining indicators within a criterion. The conversion of the evaluation of the remaining indicators (achievable project-specific points per indicator) takes place in a comprehensible manner within the scope of the weighting.

In criteria with variable indicators, the degree of fulfillment is determined as follows:

$$\textbf{Criterion}_{\text{with variable indicators}} = \textbf{CLP}_{\text{ist}} / \textbf{CLP}_{\text{max, relevant}} * 100$$

where $CLP_{max, relevant}$ represents the total of points of the countable indicators relevant for the specific project.

Variable indicators can be found in the following criteria:

Criterion	Variable Indicator
SOC1.1	Indicator 3: Radiation temperature asymmetry and floor temperature / heating period
SOC1.4	Indicator 4: No glare in daylight

Mixed use

Application rules for mixed use

Minimum requirements

The DGNB minimum requirements (exclusion criteria) stipulated in the criteria for the scheme in question must be fulfilled, for both the primary use and all secondary uses.

Secondary requirements

The secondary requirements only need to be fulfilled at whole-building level.

Partial certification

If a proper distinction can be made between the different uses, an application for partial certification can be submitted. The use that is to be assessed must be clearly defined and must be agreed with the DGNB on a case-by-case basis (project-specific certifiability enquiry – see DGNB website). The following parameters should be complied with:

- Separate energy performance certificates must exist for the different sub-areas
- Separate entrances to the building must exist
- Different uses can be identified, e.g. from the façade design
- Technical building equipment in the different sub-areas functions independently of each other

Further information on mixed use can be found on the DGNB website.

Terms and definitions

In the DGNB System some terms and definitions are repeatedly used in different criteria, for this reason these are described here in detail once and then briefly mentioned in the relevant criteria by means of the following reference symbol [T&D_xx].

T&D_01. Official scale of fees for services by architects and engineers (*HOAI*)

For the purpose of DGNB certification the terminology and chronology of the service phases is based on the German official scale of fees for services by architects and engineers (namely the *Honorarordnung für Architekten und Ingenieure* or abbreviated as *HOAI*).
This document defines 9 service phases (see Table 1) for the provision of architectural services during the building development process and it is mentioned in the following criteria: ENV1.1 “Building life cycle assessment”, ECO1.1. “Life cycle cost”, PRO1.1 “Comprehensive project brief”, PRO1.6 “Procedure for urban and design planning”, PRO2.3 “systematic commissioning”.

Table 1: Service phases according to the official scale of fees for services by architects and engineers (HOAI)

	SERVICE PHASE	DESCRIPTION
1	STRATEGIC DEFINITION (*GRUNDLAGENERMITTLUNG*)	Identifying framework and context for addressing the requirements of the design brief.
2	CONCEPT DESIGN (*VORPLANUNG*)	Outline options and proposals for addressing the requirements of the design brief.
3	DEVELOPED DESIGN (*ENTWURFSPLANUNG*)	Preparing the final design proposal meeting the requirements of the design brief.
4	PLANNING APPROVAL (*GENEHMIGUNGSPLANUNG*)	Preparing and submitting document package required for planning approval and any other relevant approval processes.
5	TECHNICAL DESIGN (*AUSFÜHRUNGSPLANUNG*)	Preparing finished working drawings and detail specifications ready for construction.
6	TENDER PREPARATIONS (*VORBEREITUNG BEI DER VERGABE*)	Conducting quantity surveys and preparing specifications of services put out to tender.
7	TENDER SUPPORT (*MITWIRKUNG BEI DER VERGABE*)	Obtaining cost estimates, calculating overall cost and supporting the selection of bidding contractors.
8	CONSTRUCTION (*OBJEKTÜBERWACHUNG*)	Supervision of construction works on site.

9	COMPLETION AND DOCUMENTATION (*OBJEKTBETREUUNG UND DOKUMENTATION*)	Compiling snagging lists and supervising snag remediation (*property management including warranty tracking*) Documenting condition of the building after final completion.

T&D_02. Level(s) - Building sustainability performance

Level(s) is a voluntary reporting framework to improve the sustainability of buildings. Using existing standards, Level(s) provides a common EU approach to the assessment of environmental performance in the built environment and an easy starting point to introduce sustainability into your work.
Within the Level(s) framework, each indicator is designed to link the individual building's impact with the priorities for sustainability at the European level. This focuses the Level(s) user on a manageable number of essential concepts and indicators at building level that contribute to achieving EU and Member State environmental policy goals.

For more information about Level(s):
http://ec.europa.eu/environment/eussd/buildings.htm
http://ec.europa.eu/environment/eussd/pdf/Level(s)_flyer-EN-web.pdf

T&D_03. *EnEV* - Energy Performance Certificate (EPC) according to the DIN 18599

The Energy Saving Ordinance *EnEV* (*Energieeinsparverordnung*) is a German regulation defining minimum requirements with regards to buildings' energy efficiency and it is applicable for both new buildings and renovation of existing buildings.

The EnEV Energy Performance Certificate (*Energieausweis*) gives the complex information about the energy quality of a building envelope and installations which serve the building or its parts. The certificate refers to the energy demand of heating, water heating, ventilation and cooling. It also includes the recommendations for the possible improvements of the energy performance of the building. The certificate is valid for the 10 years from the issue date. There are two types of EPC, the energy demand certificate and the energy use certificate. The demand certificate is based on the analysis of the technical performance while the use certificate verifies the actual energy consumption in the last 3 years. The certificate can be issued by qualified and licensed experts.

The document includes the following information:

- general information about the building: building type, address, year of the construction, number of dwellings, size of a useable area, source of energy, type of the ventilation and cooling systems
- energy efficiency class of the building (from A+ to H)
- the annual primary energy demand [kWh/(m²·a)] in comparison to reference values such as a minimum statutory energy performance requirements
- the annual final energy demand [kWh/(m²·a)] in comparison to reference values such as a minimum statutory energy performance requirements
- CO2 – emission [kg/(m²·a)] (voluntary)
- the energy quality of a building envelope U-value [W/(m²·K)]
- renewable energy – how many % of the demand is covered by particular renewable sources of energy (only in case of new buildings)

- if the energy use certificate is being issued, additionally the following data are required:
    - energy efficiency class of the building (from A+ to H) based on the average energy use from last 36 months

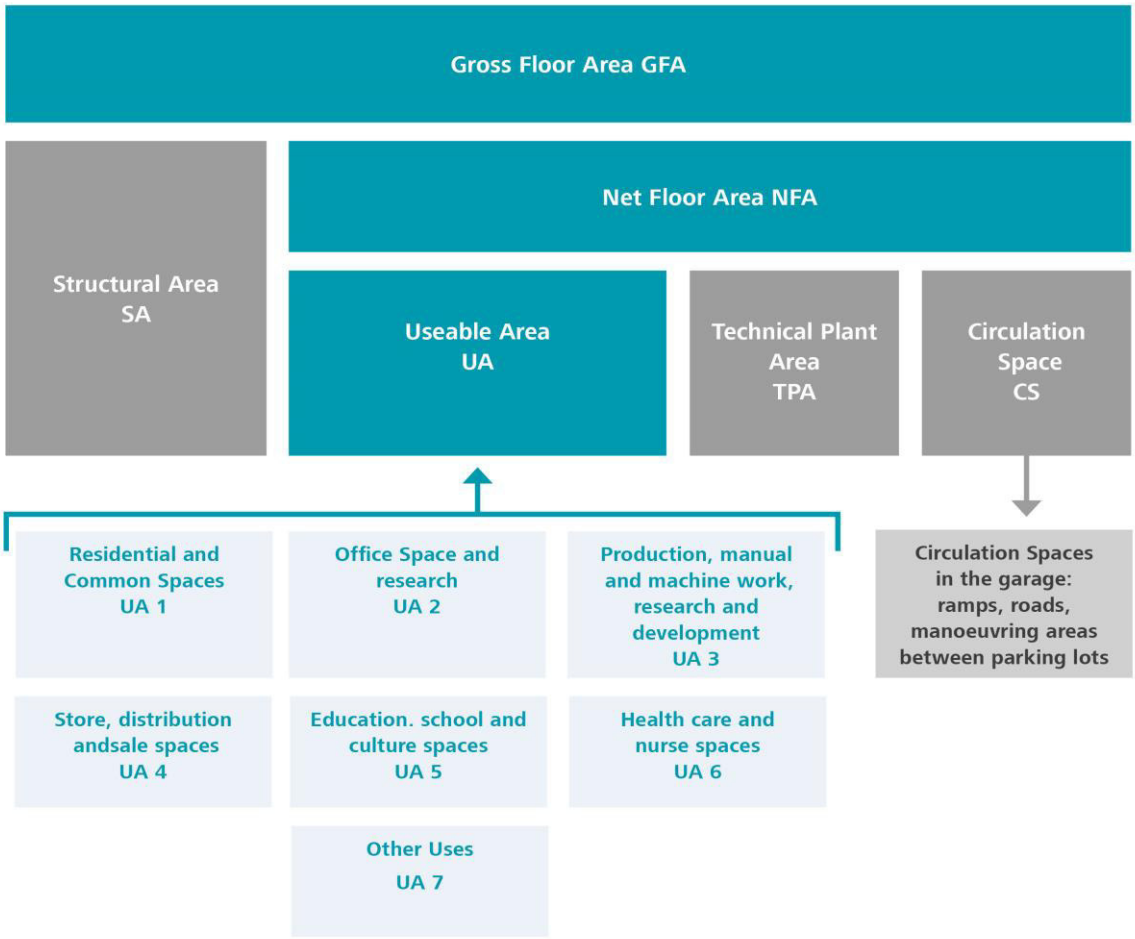
- energy use in particular years

The German requirements comply with the EU regulations such as the Directive 2010/31/EU of The European Parliament and of the Council of 19 May 2010 on the Energy Performance of Buildings (available in different languages: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0031).
However, the content of the energy performance certificate may vary depending on local conditions of a country. The EnEV certificate can be replaced by the EU Energy Performance Certificate, building energy performance simulation or by a local one (criterion ENV1.1 provides the detailed information about the alternatives regarding the building energy performance documentation)

T&D_04. Areas and volumes of buildings

Areas and volumes of a building are defined according to the German DIN 277-1:2016-01: Areas and volumes of buildings – Part 1: Building construction (*DIN 277-1:2016-01: Grundflächen und Rauminhalte im Bauwesen – Teil 1: Hochbau*).
This standard refers to particular surface areas within the building (see Figure 1) and has been adopted by DGNB to standardise calculations. Please note that the definitions of floor areas vary depending on the country and for the purpose of the DGNB certification the surface calculations have to be conducted as described below.

Figure 3: Definition of areas according to DIN 277-1:2016-01



Gross Floor Area – GFA (in German *Brutto-Grundfläche - BGF*)

Sum of all floor areas within all floors of the building. The following areas are NOT included in the GFA:

- areas within a floor plan that do not exist e.g. airspace area over atriums, galleries or ceiling openings
- areas e.g. at the attic which do not have access, are not walkable or not being used because of other reasons
- areas exclusively dedicated to servicing, maintenance, inspection and maintenance of structure and technical systems (e.g. unusable roofs, fixed access ladders and roof gangways, servicing gangways in suspended ceilings, crawl space, catwalks in suspended ceilings)
- external parts of the building that are not structurally connected to the building (e.g. external stairs, external ramps, pergolas, outdoor sitting areas, terraces)

Net Floor Area – NFA (in German *Netto-Raumfläche NRF*)
Sum of all useable areas within all floors of the building. It includes useable areas UA (in German *Nutzfläche NUF*), technical plant areas TPA (in German *Technikfläche TF*) and circulation space CS (in German *Verkehrsfläche VF*):

$$NFA = UA + TPA + CS$$

Following elements are included in the NFA:

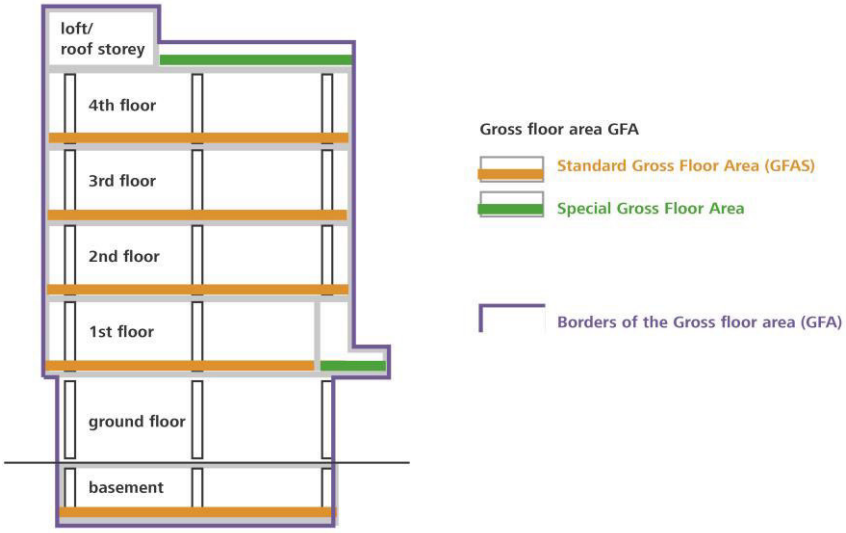
- exposed installations
- objects that are permanently built-in (e.g. ovens, heating and air-conditioning appliances, baths and showers)
- brick facing and cladding that is not floor to ceiling height
- build-in furniture (e.g. build-in wardrobe, shelving)
- movable partitions (e.g. curtains, folding partition walls)
- areas of the walk-in installations and elevator shafts where clear cross section > 1,0m² when not walkable, considered as part of SA

For the determination of NFA the measurements between building structure at the level of the floor or ceiling covering are considered. Structural and artistic offsets, skirting boards, kerbs, undercutting, nosing such as projecting parts of windows and doors are not considered.
Base surface of a sloping structures (e.g. stairs, ramps or tribunes) are to be added in case they do not overlap with other floor areas.
Floor areas under the lowest staircase or ramp are assigned to the floor plan level on which the staircase or ramp begins. According to their use, they are shown as usage area (UA), technical plant area (TPA) or circulation space (CS).
Base areas of installation and elevator shafts with a clear cross-section > 1.0 m² are only determined in the plan view planes as net floor area (NFA) when walkable. Otherwise, their base area is added to the structural area (SA).

<u>Standard</u> Gross Floor Area (GFAs) and Net Floor Area (NFAs)
Includes those parts of GFA/NFA which are covered by a roof and fully enclosed (floor, ceiling and wall enclosure) (see figure 2). Rooms that are partially enclosed by the waterproofed or open-work structures are not included (e.g. perforated garage gate, shutters)

<u>Special</u> Gross Floor Area and Net Floor Area
Refers to all rooms and floor areas based on GFA/NFA and are structurally connected to the building but not fully enclosed such as loggias, balconies, terraces on flat roofs, courtyards, entrance areas, external stairs (see figure 2).

Figure 4: Definition of standard and special GFA/NFA



Translation:

DG = loft/roof storey

4. OG = 4th floor

3. OG = 3rd floor

2. OG = 2nd floor

1. OG = 1st floor

EG = ground floor

KG = basement

Heights (h) can be deleted from the drawing and only surface accepted by DGNB to be highlighted on the scheme.

For determining the gross floor area (GFA), the outer dimensions of the building structures, including clothing (e.g. outside of plaster layers or outer shells of multi-shell wall constructions), must be set at the height of the top of the floor or ceiling coverings.

Structural Area – SA (in German *Konstruktions-Grundfläche KGF*)

All areas under the building structure in each level through which they lead as a construction. (e.g. walls, columns, pillars, chimneys):

$$SA = GFA - NFA$$

For the determination of SA the measurements of the building structure together with the clothing at the level of the floor or ceiling covering are considered.

Wall openings (e.g. doors, windows or passageways), installations and elevator shafts that are not walkable or ≤ 1,0m^2

Instead of a determination based on individual dimensions of the structure, the structural area (SA) can be determined as the difference between the gross floor area (GFA) and the net floor area (NFA).

Usable Area – UA (in German *Nutzungsfläche NUF*)

Part of the area used for the essential purpose of the works is determined as usable area (UA). The usable area (UA) can be further subdivided according to Table 2.

Table 2: Type of usable area (UA)

USE GROUP	FLOOR AREAS AND ROOMS
1 – Residential and common spaces (UA 1)	1.1 Living spaces 1.2 Common rooms 1.3 Break rooms 1.4 Waiting rooms 1.5 Dining rooms
2 – Office space (UA 2)	2.1 Office rooms 2.2 Open-plan offices 2.3 Meeting rooms 2.4 Design rooms 2.5 Rooms with counter(s) 2.6 Control rooms 2.7 Surveillance rooms
3 – Production, manual and machine work, research and development (UA 3)	3.1 Workshops (where these are permanent working areas) 3.2 Technological laboratories 3.3 Physics, engineering physics and electrical engineering laboratories 3.4 Chemistry, bacteriology and morphology laboratories
4 – Store, distribution and sale spaces (UA 4)	4.4 Acceptance and distribution areas (where these are permanent working areas) 4.5 Sales rooms 4.6 Showrooms 3.2 Workshops (where these are permanent working areas)
5 – Education, school and culture spaces (UA 5)	5.1 Classrooms with fixed seating 5.2 General classrooms and practice rooms without fixed seating 5.4 Dedicated classrooms and practice rooms without fixed seating 5.5 Library rooms 5.6 Assembly rooms or areas 5.7 Stages, studios 5.8 Exhibition rooms

6 – Healthcare and nurse spaces (UA 6)	Rooms for general examination and treatment (for primary medical care, consultation, etc.), rooms for special examination and treatment (for endoscopy, physiology, dentistry, etc.), operating rooms, maternity rooms, rooms for radiation diagnostics and radiotherapy, rooms for physiotherapy and rehabilitation, bed rooms , Intensive care rooms
7 – Other uses (UA 7)	Storage rooms, bicycle storage, refuse collection rooms, vehicle parking areas (garages, halls, protective roofs), passenger accommodation areas (railways and piers, etc.) technical installations for the operation of equipment specific to use (computerised server room, compressor room for a workshop compressed air system, switching rooms for medical facilities, control rooms, control centers, etc.), technical installations for the supply and disposal of other structures (power stations, gasworks, transformer stations, sewage treatment plants, etc.), shelters Sanitary facilities (toilets including vestibules, washrooms, shower rooms, sauna rooms, cleaning rooms, etc.), changing rooms (closet rooms, dressing rooms, etc.), cleaning locks

Gross Volume – GV (in German *Brutto-Rauminhalt BRI*)

Gross volume (GV) includes the volume of all rooms and building structures that are above the gross floor area (GFA) of the building. The gross volume (GV) is enclosed by the outer boundary surfaces formed by the structural building blocks, exterior walls and roofs including dormers or roof skylights.
The volume of the following elements does not belong to the gross volume (GV):

- deep and shallow foundations;
- light wells;
- external stairs and external ramps not connected to the structure by building constructions;
- entrance roofing;
- roof overhangs, as far as they do not represent coverages for space contents of area (S) according to 5.6.2;
- projecting sun protection systems;
- chimney heads, ventilation pipes or ventilation ducts that extend beyond the roof covering;
- skylights ≤ 1.0 m3;
- pergolas and paved patios or terraces.

The gross volume (GV) is to be determined from the calculated gross floor areas (GFA) and the associated heights. The heights for the determination of the gross volume (GV) are the vertical distances between the surfaces of the ceiling coverings in the respective floor plan planes or, in the case of roofs, the surfaces of the roof coverings.
The height of the lowest floor of the building is defined as the distance from the underside of the subfloor and floor slabs, which do not serve the foundation, to the top of the ceiling covering the level above it.
In the case of structures or parts of buildings which are bounded by non-vertical or non-horizontal surfaces, the volume shall be determined according to appropriate geometric formulas.
For the heights of room contents of the area S (special case) the upper edges of the limiting building constructions (eg parapets, attics, railings) are decisive.

T&D_05. Cost Groups (*Kostengruppe*) according to German DIN 276-1:2008

Cost Groups are categories of associated costs being incurred during a building development process. Particular costs are identified and classified according to their character and belong to the following main groups:

COST GROUP	BUILDING COMPONENT
100	Site
200	Clearance and development
300	Structural components – construction works
400	Technical components – installations
500	External works
600	Furnishings, furniture and artistic appointments
700	Incidental buildings costs

For simplification the cost group numbering (100 to 700) is not considered in the international version of the DGNB System. We will only refer to the **building components** (structural and building components according to their main and sub-levels) as described in details in Appendix 1 of criterion ECO1.1 “Life cycle cost”.
These are mentioned in the following criteria: ENV1.1 “Building life cycle assessment”, ENV1.3 “Sustainable resource extraction”, ECO1.1 “Life Cycle cost”, PRO1.5 “Documentation for sustainable management”.

T&D_06. German Information Centre for Construction Costs

The German Information Centre for Construction Costs (namely the Baukosteninformationszentrum or shortly BKI) is a German institution operated by the German Chambers of Architects, that created and operates the BKI-database, a complex database of construction costs. Based on the calculation of several thousand real projects, the BKI-database is a professional and annually updated source of information for cost planning of construction works.
The information given by the database contains the cost parameters (proportion of costs from particular cost group in relation to a certain reference unit based on the German DIN 277 [T&D_05]) and planning parameters (value that determines the ratio of certain areas in relation to the Usable Area and the Gross Floor Area [T&D_04]) for different building types.
This database is a source of information for architects, engineers, experts and professionals that work in the field of cost estimation of construction projects in the initial service phases [T&D_01].
The German Information Centre for Construction Costs is mentioned in ECO1.1 “Life cycle cost”.

For more information (website only available in German language): http://www.bki.de/ueber-uns.html

Appendix 1

Assembly buildings

The following buildings can be covered using the scheme “Assembly buildings”:

- Congress building;
- Fair and city halls;
- Theaters and concert halls;
- Museums;
- Cultural, civic centers and libraries;

Note: In some criteria, the above-mentioned building types are sometimes summarized in the different categories. Allocation of the buildings to the relevant types can be found in the following table:

Criterion	Variable Indicator
ENV1.1	▪ Type I: Buildings without hall character; ▪ Type II: building with hall character;
ECO2.1	Indicator 6 ▪ Type I: Buildings such as congress buildings, theaters and concert halls, museums, cultural and community centers and libraries; ▪ Type II: Buildings such as B. Exhibition and city halls;
SOC1.3	▪ Type I: Buildings such as Congress building; ▪ Type II: Buildings such as Theaters and concert halls; ▪ Type III: Buildings such as Museums, cultural, civic centers and libraries; ▪ Type IV: Buildings such as Fair and city halls;
SOC1.4	▪ "Type I areas" (Note: The evaluation takes place via **Education**); ▪ "Type II areas" (Note: The assessment is carried out via **Logistics**);
TEC1.2	▪ Type I: Buildings such as congress buildings, cultural, civic centers and libraries; ▪ Type II: Buildings such as Theaters and concert halls, exhibition halls and city halls, museums;

Note: The detailed description of the assignment can be found in the respective criteria in APPENDIX A - DETAILED DESCRIPTION under “IV. Usage-specific description ”.

Environmental quality

The six criteria of environmental quality allow an assessment to be made with regard to the **effects of buildings on the global and local environment** as well as the **impact on resources and the generation of waste**.

ENV1.1	Building life cycle assessment
ENV1.2	Local environmental impact
ENV1.3	Sustainable resource extraction
ENV2.2	Potable water demand and waste water volume
ENV2.3	Land use
ENV2.4	Biodiversity at the site

ENV1.1

Building life cycle assessment

Objective

Our objective is to ensure a consistent life cycle approach to the planning of buildings in order to reduce emissions-related impacts on the environment and consumption of non-renewable resources to a minimum across all stages in the life of a building.

Benefits

A life cycle approach to the building planning, using life cycle assessment, helps building commissioners and designers to make environmentally friendly decisions on the basis of comprehensive information. This enables the identification of solutions that are optimised, both in terms of various relevant environmental issues and in terms of various locations and times of environmental impacts. The application of a consistent method is useful for reporting relevant environmental indicators for a building, such as CO_2 emissions or energy demand throughout the entire life cycle.

Contribution to sustainability

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	3.9	Effects of chemicals, air, water and soil contamination	7.1.a/b	Resource conservation
	7.2	Proportion of renewable energy	7.2.a	Renewable energy
	7.3	Energy efficiency	12.1.b	Sustainable consumption
	8.4	Global resource efficiency and decoupling of economic development	13.1.a	Climate protection
	12.2	Use of natural resources		
	13.2	Climate protection measures in guidelines, strategies and planning		
Moderate	6.3	Improvement of water quality	3.2.a	Air pollution
	14.1	Avoiding marine pollution	14.1.aa/ab	Protect the seas
	14.3	Avoiding acidification of the seas		

Low	6.4	Efficient use and sustainable extraction of water	6.1.a	Water quality
			7.2.b	Renewable energy
	12.4	Environmentally friendly handling of chemicals and waste	8.1	Resource conservation
	15.1	Conservation of land and freshwater ecosystems	15.2	Ecosystems

Outlook

The reference values for construction and operation will be tightened further in future in accordance with increasing requirements regarding national climate protection, emission and resource consumption targets for industry and the building sector. In order to promote positive measures with regard to energy demand (which is not regulated by building energy laws), an appropriate expansion of the system limits will be developed. This will enable escalators and lifts to be taken into consideration in future. The increasing level of technology and engineering in buildings will place more emphasis on building services installations. This will also require regular comprehensive data regarding the components used in the technical building equipment as a basis.

The scope of analysis of the life cycle assessment (LCA), as a method for evaluating ecological impacts based on the life cycle, should model additional environmental impacts in future. If qualification and characterisation methods are available which have been accepted with a broad consensus among experts and for which suitable data is available in life cycle assessment data sets, additional environmental impacts should be calculated using the life cycle assessment. Examples of such impacts include ecotoxicity, use of natural resources and biodiversity.

In future, it will be possible to create life cycle assessments more easily thanks to improved, networked tools and to provide decision-makers with a greater range of reliable evaluations in order to enable better buildings to be planned more quickly. As a result, life cycle assessments will also increase in importance for life cycle optimisation across all phases of building planning.

Indicators 1 and 2 are inserted as incentives to promote earlier and more consistent integration of the life cycle assessment method into building planning processes. In the long term, these indicators can be omitted again once life cycle assessment calculations are established as a normal element of building planning processes.

Share of total score

	SHARE[1]	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	**9.5%**	**8**
Consumer market **Department stores**		
Logistics **Production**		
Assembly buildings	**7.5%**	**6**
Shopping centre	**9.0%**	**8**

[1] Variable, building location related factors from the criterion ENV2.2 may influence the share of total score.

EVALUATION

Points are awarded for incorporation of the life cycle assessment results in the early planning process and use of an energy consumption analysis with a scope that goes beyond the statutory requirements (indicator 1). In addition, implementation and comparison of variants with life cycle assessment calculations is evaluated positively (indicator 2). The results of a complete building life cycle assessment, calculated in accordance with predefined conventions, are evaluated on basis of the comparison values (indicator 3). If the target values for the life cycle assessment have been exceeded, up to 20 additional points can be awarded. In addition, an "*Agenda 2030 bonus*" is awarded if the building operation is climate-neutral or partly climate-neutral and /or if the final lifecycle values are equal to or below the half of the GWP construction benchmark. The use of reused components or elements is included in the life cycle assessment calculation. Contribution to the circular economy is thereby fully implemented in the "Life cycle assessment comparison calculation" indicator. In this criterion a maximum of 130 points including bonuses can be achieved.

NO.	INDICATOR	POINTS
1	**Life cycle assessments in planning**	
1.1	**Integration of life cycle assessments into the planning process**	**Max. 10**
1.1.1	A life cycle assessment model is created for the project in an early planning phase. The building variants included in the planning phase are compared with regard to their potential environmental impacts resulting from construction and relevant potential environmental impacts resulting from use. As part of this, information from at least three different specialist planners or subject areas (e.g. support structure planning, heating, ventilation and air conditioning planning (HVAC), building physics planning or energy planning) is included in the assessment. As a minimum, the typically expected life cycle assessment parameters for the construction (e.g. derived from studies or benchmarks) and specific values for energy-related impacts are determined and communicated within the planning team, differentiated by operation and construction.	+8
1.1.2	Life cycle assessment results are determined for the building at regular intervals during the planning process (adjusted to match the relevant planning status) and are discussed in accordance with the specific planning issues and communicated (differentiated by operation and construction) within the planning team. The construction and all relevant building-related usage effects are integrated into the calculations at least in accordance with the simplified process in service phase 4 of the project at the latest. The service phases described under the chapter “terms and definitions” ([T&D_01]) of the document “Evaluation and structure of the DGNB system”.	+3
1.1.3	Life cycle assessment results are determined for the operating phase of the building, going beyond the statutory scope of the energy calculation. This includes, for example a differentiated analysis of the energy demand related to the building use in or at the building or at the site (AI, power supply, production, (effect) lighting, etc.), the complete energy demand of the technical building equipment (lifts, escalators, etc.) or similar. The results are communicated within the planning team.	+2
	INNOVATION AREA	**Same as 1.1**
Re 1.1	Explanation: Alternative approaches that accomplish integration of life cycle assessments for the building into the planning process can be selected and credited.	

2	**Life cycle assessment optimisation**	
2.1	**Life cycle assessment optimisation during the planning process**	**Max. 18**
2.1.1	The effects of significant alternative decisions on the expected life cycle assessment results are determined for the building. This process is carried out as a full consideration of the entire building. A plausible range of alternatives are available, which provide opportunities for improvement. The planning team select a suitable solution and explain the reasons for their choice.	
	■ Per alternative as part of a full consideration within the scope of service phase 2, 3 or 4 (according to the [T&D_01])	+8
	■ Per alternative as part of a full consideration within the scope of service phase 5, 6 or 7 (according to the [T&D_01])	+4
2.1.2	The effects of significant decisions on the expected life cycle assessment results are determined for the building. This process is carried out as a partial analysis (section) for the relevant scope of analysis. A plausible range of alternatives are available, which provide opportunities for improvement. The planning team select a suitable solution and explain the reasons for their choice.	
	■ Per alternative as part of a partial analysis within the scope of service phase 2, 3 or 4 (according to the [T&D_01])	+6
	■ Per alternative as part of a partial analysis within the scope of service phase 5, 6 or 7 (according to the [T&D_01])	+2
	INNOVATION AREA	**Same as 2.1**
Re 2.1	Explanation: Alternative approaches that accomplish optimisation of the life cycle assessment for the building can be selected and credited.	

3	**Life cycle assessment comparison calculation**	
3.1	**Weighted environmental impacts**	**Max. 90**
	Weighted environmental impacts according to the partial calculation method (PCM)	**Max. 70**
3.1.1	Building life cycle assessment results provided	At least
3.1.2	Evaluation of the building life cycle assessment results	0–90
	Evaluation of the building life cycle assessment results according to the PCM	0-70
	■ Weighted environmental impacts exceed the weighted limit value	0
	■ Weighted environmental impacts comply with the weighted reference value (PCM)	30
	■ Weighted environmental impacts comply with the weighted reference value	40
	■ Weighted environmental impacts reach the weighted target value (PCM)	60
	■ Weighted environmental impacts reach the weighted target value	80
	■ Weighted environmental impacts fall below the weighted target value (PCM)	70
	■ Weighted environmental impacts fall below the weighted target value	90

4	**AGENDA 2030 BONUS – CLIMATE PROTECTION GOALS**[2]	
4.1	**Potential to achieve climate neutrality**	**+ max. 30**

[2] Note: no bonus points can be awarded for indicators 4.1.4 and 4.1.6 (construction) with the partial calculation method (PCM)

4.1.1	Partial consideration of the building operation – building energy demand: The building-related energy demand is determined in accordance with the rules of the "Framework for carbon neutral buildings and sites" of the DGNB. The boundary conditions of the use phase must reflect the reality as precise as possible. On site generated renewable energy can at least compensate the building energy demand related CO_2 equiv. emissions.	+10
4.1.2	Partial consideration of the building operation – user energy demand: The user-related energy demand (usually exceeds the standard EPC calculation boundaries) is determined in accordance with the rules of the "Framework for carbon neutral buildings and sites" of the DGNB. The boundary conditions of the use phase must reflect the reality as precise as possible. On site generated renewable energy can at least compensate the user energy related CO_2 equiv. emissions.	+10
4.1.3	Climate-neutral building operation: Alternatively, to 4.1.1 and 4.1.2 the following can be assigned: The total energy demand (operation = building energy plus user energy) is determined in accordance with the rules of the "Framework for carbon neutral buildings and sites" of the DGNB. The boundary conditions of the use phase must reflect the reality as precise as possible. On site generated renewable energy can at least compensate the building operation (building + user energy demand) related CO_2 equiv. emissions.	+20
4.1.4	Climate neutral construction: The total greenhouse gas emissions from manufacture, maintenance and end-of-life of the construction ($GWP_{C.Proj.}$), determined via a life cycle assessment according to DGNB, fall below the reference value $GWP_{C.ref}$ for the construction by at least 50%.	+5
4.1.5	Climate action roadmap for "the climate neutral building operation achieved by 2040": for the operation of the building there is a plausible climate action roadmap in accordance with the "Framework for carbon neutral buildings and sites", which will result in a CO_2 neutral operation by 2040.	+5
4.1.6	Climate action roadmap for "the climate neutral building" (calculation boundary: operation plus construction): for the whole building lifecycle (construction + operation) there is a plausible climate action roadmap in accordance with the "Framework for carbon neutral buildings and sites", which will result in a CO_2 neutrality by 2050.	+5

5 CIRCULAR ECONOMY

5.1 Use of reused components or structural elements

The environmental pollution prevented by the reuse of components or structural elements can be recorded in the life cycle assessment calculation and incorporated into the life cycle assessment evaluation. The contribution of the reuse of a component or element to the circular economy is thereby depicted in indicator 3, "Life cycle assessment comparison calculation".

5.2 Building generates energy "for other users"

The excess energy is recorded in the life cycle assessment and incorporated into the life cycle assessment evaluation. The contribution to the circular economy is thereby fully implemented in indicator 3, "Life cycle assessment comparison calculation".

6 Halogenated hydrocarbons in refrigerants

6.1 GWP factor of refrigerants in refrigeration systems — 2

No use of refrigerants with a CO_2 equiv. ≥ 150 kg.	+2

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The CO_2 emission values for building operation determined on the basis of the life cycle assessment represent part of the "Scope 1" and "Scope 2" emissions in accordance with the "Greenhouse Gas Protocol" (www.ghgprotocol.org). This parameter can also be used in CSR reports or as part of environmental management measures. The life cycle assessment results and calculation basis can be used for reporting in accordance with the "Level(s) – Common EU framework of core environmental indicators".

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Final energy demand (building operation), differentiated by heating, cooling, ventilation, hot water and lighting – corresponds to elements of Level(s) indicator 1.1.1	[kWh/m²a]
KPI 2	Primary energy demand (building operation), divided into total primary energy demand, non-renewable primary energy demand and renewable primary energy demand, differentiated by heating, cooling, ventilation, hot water and lighting – corresponds to elements of Level(s) indicator 1.1.1	[kWh/m²a]
KPI 3	Exported energy – corresponds to Level(s) indicator 1.1.2	[kWh/m²a]
KPI 4	CO_2 emissions (building operation) with reference values for net floor area (NFAs) and year (= life cycle assessment results for GWP, "Use" section)	[kg CO_2-e/m²a]
KPI 5	$CO_{2\text{-}e}$ emissions (building operation) with reference values for building users (in accordance with assumptions across all criteria) and year (= life cycle assessment results for GWP, "Use" section)	[kg CO_2-e/person*a]
KPI 6	$CO_{2\text{-}e}$ emissions (construction/$CO_{2\text{-}e}$ involved) with reference values for net floor area (NFAs) and year (= life cycle assessment results for GWP, "Construction" section)	[kg CO_2-e/m²*a]
KPI 7	$CO_{2\text{-}e}$ emissions (life cycle) with reference values for net floor area (NFAs) and year (= life cycle assessment results for GWP, "Use" and "Construction"); corresponds to Level(s) indicator 1.2, Simplified Reporting Option Please note: Can be used as a Simplified Reporting Option when using the complete process. When using the simplified process, "Incomplete Life Cycle" must be specified. For complete reporting, in accordance with Level(s), all modules must be determined and specified in accordance with EN 15978.	[kg CO_2-e/m²*a]
KPI 8	Life cycle assessment results, complete in accordance with the DGNB method; corresponds to Level(s) indicator 2.4 Note 1: Unlike the DGNB, in accordance with Level(s), all modules must be specified in accordance with EN 15978. Note 2: In accordance with Level(s), the indicators "ADP fossil fuels", "Biotic resources, renewable" and "Biotic resources, non-renewable" must also be	[Life cycle assessment units]

	specified.	
KPI 9	Detailed component list; corresponds to Level(s) indicator 2.1, "Building Bill of Materials" Note 1: The "Bill of Materials" corresponds to a detailed component list (99% complete) specifying all dimensions and including allocation to four material groups	[kg]
KPI 10	Component list with durations of use; corresponds to Level(s) indicator 2.2, "Scenarios for lifespan" Note: All assumptions regarding durations of use for products, materials, elements, etc. should be specified in accordance with Level(s) for all modules in accordance with EN 15978	[years]
KPI 11	Construction and demolition waste; corresponds to Level(s) indicator 2.3 "Construction and Demolition Waste" Please note: All construction waste and future demolition waste for all modules in accordance with EN 15978 in kg of waste and material assignment – not included in the DGNB method.	[kg waste/m²]
KPI 12	GRI Disclosure 302-01 "Energy Consumption within the Organization" Note 1: Divided into heating, cooling and other energy demands.	[kWh/a]
KPI 13	GRI Disclosure 305-01 "Direct Greenhouse Gas Emissions" Note 1: In accordance with GHG protocol "Scope 1" definition. Note 2: Also communicate biogenic CO_2 emissions separately. Note 3: The $CO_{2\text{-}e}$ emissions produced directly at the building can be incorporated here	[kg CO_2-e/a]
KPI 14	GRI Disclosure 305-02 "Energy Indirect Greenhouse Gas Emissions" Note 1: In accordance with GHG protocol "Scope 2" definition. Note 2: This includes $CO_{2\text{-}e}$ emissions from electricity, long-distance district heating, etc. from external energy-related sources.	[kg CO_2-e/a]
KPI 15	GRI Disclosure 305-03 "Other Indirect Greenhouse Gas Emissions" Note 1: In accordance with GHG protocol "Scope 3" definition. Note 2: $CO_{2\text{-}e}$ emissions from module B1–B5 can be referenced here	[kg CO_2-e/a]
KPI 16	GRI Disclosure 305-05 "Reduction of Greenhouse Gas Emissions" Note 1: Relates to operation of the building and the resulting $CO_{2\text{-}e}$ emissions.	[kg CO_2-e/a]

Synergies with DGNB system applications

- **DGNB BUILDINGS IN USE:** High synergies with criterion ENV9.1 from the scheme for buildings in use: For operation, the energy requirement values from the DIN V 18599 (detailed description of the norm under the chapter [T&D_03]) calculation or simulations can be used. This enables consumption values to be checked and helps users to optimise operation. The CO_2 values from the use phase can likewise be used for operation.

- **DGNB RENOVATED BUILDINGS:** High synergies with criteria ENV1.1 and ENV2.1 from the scheme for renovated buildings.

- **DGNB DISTRICT:** The calculated life cycle assessment results for the buildings can be transferred directly as achieved values into the criteria ENV1.1 and ENV2.1 from the schemes for urban districts and business districts.

- **DGNB INTERIORS:** Elements of the calculations can be transferred directly into criterion ENV1.1. In addition, results for CO_2 emissions and energy efficiency can be transferred into criterion ENV2.1.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Buildings cause emissions and consume resources in all phases of their life cycle, from construction (e.g. due to use of construction materials and construction products) to use (e.g. due to building operation and maintenance) through to end-of-life (e.g. due to demolition). Emissions pass into the air, water and soil and cause a wide variety of environmental problems. These include global warming, destruction of the stratospheric ozone layer, summer smog, forest dieback, fish mortality and eutrophication of water and soil. A life cycle approach to the planning of buildings helps building owners and designers to make decisions that favour solutions optimised in terms of various environmental issues, in terms of various locations and times of environmental impacts.

II. Additional explanation

Using life cycle assessment data, these emissions and resource consumptions are calculated throughout the entire life cycle – for construction, operation and end-of-life – and can be evaluated using benchmarks. Environmental problems are found in the following environmental indicators:

(1) Climate change: Global warming potential (GWP)
(2) Destruction of the stratospheric ozone layer: Ozone depletion potential (ODP)
(3) Summer smog, ground-level ozone: Photochemical ozone creation potential (POCP)
(4) Acidification of soil, forest dieback and fish mortality: Acidification potential (AP)
(5) Eutrophication of surface water: Eutrophication potential (EP)
(6) Non-renewable primary energy demand (PEnr)
(7) Total primary energy demand (PEtot)
(8) Proportion of renewable primary energy
(9) Abiotic, non-energy resource consumption: Abiotic basic resource depletion potential (ADPelements)
(10) Water consumption: Net use of fresh water (FW)

The building LCA should be conducted as early as the planning phase if possible. It can also serve as an important instrument for improving the ecological quality of the building.

III. Method

Indicator 1: Life cycle assessments in planning

The objective of indicator 1.1 is to clearly present life cycle assessment results from an early planning phase, tailored to the specific context or to the point in time and scope of planning.

To this end, a life cycle assessment model (indicator 1.1.1) should be drawn up in an early planning phase (service phase 2–3). The most likely/preferred building variants are compared with regard to their potential environmental impacts resulting from construction and use phase. As part of this, information from at least three different specialist designers (e.g. support structure designers, heating, ventilation and sanitation designers, building physics designers or energy designers) is included in the assessment. As a minimum, typical life cycle assessment parameters for the construction and specific values for energy-related impacts are determined, differentiated by operation and construction and communicated within the planning team.

In addition, points can be included in the evaluation if a life cycle assessment model is created and used for evaluation at least in the service phase 4 of the project (indicator 1.1.2). Construction and all relevant building-related usage effects must be included into the calculations at least in accordance with the simplified method described in indicator 3.

Construction-related or use-related expenditure that goes beyond this assessment framework or expected "environmental yields" can also be included in the assessment in accordance with indicator 1.1.1 or 1.1.2 – these can include transport expenditure, construction site expenditure, demolition or recycling expenditure, etc. Life cycle assessments in the planning phase can also take into account, all aspects that are not part of the DGNB calculation scope in accordance with indicator 3, such as the inclusion of exterior space or other construction components. It is likewise possible to factor conventions into the assessments, such as reference periods or reference values.

For assessment during the planning process and communication of the life cycle assessment results to the planning team, target values (tailored to the planning status) should be defined that are compared to the achieved values in various planning phases.

In principle, the calculation method can be freely chosen, but it should fulfil the objectives of the sub-indicators. At the very beginning of the planning process, simple tools can be selected, such as the use of statistical construction parameters as a starting point for calculation with a combination of the energy-related impacts on a few selected environmental indicators.

If life cycle assessment results are determined for the operating phase of the building across the entire scope of analysis as defined by the law, additional points can be included in the assessment (indicator 1.1.3). This includes, for example, a differentiated analysis of the energy demand related to the building use in or at the building or at the site (AI, power supply, production, (effect) lighting, etc.), the complete energy demand of the technical building equipment (lifts, escalators, etc.) or similar. The results should likewise be communicated within the planning team.

Indicator 2: Life cycle assessment optimisation

The objective of life cycle assessment optimisation during the planning process is to address the environmental impact of all stages in the life of a building as early as possible and to reduce or optimise them via variant calculations. Life cycle assessment optimisations should be carried out at various suitable points in time.

Alternatively, full considerations (life cycle assessment results for the entire building in accordance with the scope of analysis of indicator 3 and the minimum scope of analysis specified in indicator 1) or partial analyses (life cycle assessment results for a section of the scope of analysis) can be incorporated into the evaluation.

Optimisations should investigate the life cycle assessment results of significant alternatives for decisions that are not irrelevant. Depending on the planning phase, these can vary greatly and affect aspects such as variants of the A/V ratio, duration of use of planned components or the use of alternative manufacturers.
Aspects that are not part of the scope of analysis of the "life cycle assessment comparison calculation" can also be taken into account for calculating life cycle assessment variants (see indicator 3). This includes for example, consideration of additional components (external installations or equipment). An expanded scope of analysis can also include the assessment of possible environmental yields. Conventions that differ from the life cycle assessment comparison calculation defined below (see indicator 3), such as reference periods, reference values, etc., can also be factored into the alternatives. All environmental indicators, included in the evaluation of indicator 3, should be taken into account in order to make optimisation. When using only one or two core indicators such as GWP and PEnr as part of an optimisation, a suitable method must be used to ensure that the potential environmental impacts are not

shifted to other environmental indicators to any great extent.

The findings of the life cycle assessment optimisation should be incorporated into the decision-making process. A plausible range of alternatives are available, which provide opportunities for improvement. The planning team select a suitable solution and explain the reasons for their choice. The number of alternatives for which comprehensive or partial life cycle assessment calculations were carried out in early or later planning phases is evaluated.

Indicator 3: Life cycle assessment comparison calculation

The methodology can be found in the section "DGNB life cycle assessment method" (below).

Indicator 4: Agenda 2030 bonus – climate protection goals

The objective is to encourage solutions that implement long-term climate protection targets today. This indicator evaluates whether it can be demonstrated via scenario calculations that at least climate neutrality has been achieved for the following aspects:

- CO_2 equiv. compensation for the building energy demand (indicator 4.1.1);
- CO_2 equiv. compensation for the user energy demand (indicator 4.1.2);
- Climate neutral building operation (building energy plus user energy demand) (indicator 4.1.3);
- Climate neutral construction (CO_2 equiv. construction materials) (indicator 4.1.4);
- Climate action plans for building operation (indicator 4.1.5) or for the whole lifecycle (construction and operation) (indicator 4.1.6);

For the indicators 4.1.1, 4.1.2 and 4.1.3:
calculation method for CO_2 equiv. emissions of a building operation or construction must be carried out in accordance with the rules defined in the "Framework for carbon neutral buildings and sites" of the DGNB. In addition, the following aspects have to be considered:

- If no thermal dynamic simulation is used to determine the energy demand, it is recommended to adapt the statutory calculation methodology to realistic parameters. The data quality index, described in the DGNB "Framework for carbon neutral buildings and sites" evaluates a performance of the calculation tool. It evaluates technical, spatial and temporal aspects for a realistic energy / CO_2 calculation.
- For indicators 4.1.1 and 4.1.2 the following simplified calculation method, which deviates from the DGNB "framework for carbon neutral buildings and sites", for the CO_2 emission calculation is accepted: If the CO_2 emissions from the building operation (building or user energy demand) are lower than the annual total CO_2-emissions from the renewable energy produced onsite, requirements are fulfilled. For onsite generated energy the same CO_2 factors to be applied as for the off-site final energy carriers (e.g. electricity mix data-set for photovoltaics, local district heating / gas / pellets / etc. for solar thermal energy, etc.).
- The following applies to the indicator 4.1.3: According to the DGNB framework, use of the specific CO_2 emission factors for the "green" electricity or other renewable energy sources is permitted. Nonetheless, purchase of the renewable energy from external sources must be considered as the last available measure and all requirements for energy suppliers must comply with the rules described in the DGNB "Framework for carbon neutral buildings and sites".

- The acquisition of the CO_2 compensation certificates cannot be taken into the account either for the “Operation” or “Operation and Construction” assessment.
- For indicator 4.1.3, the points can only be accepted if climate action pass (a climate protection certificate) with all mandatory information for the building operation according to the "Framework for carbon neutral buildings and sites" of the DGNB has be submitted.
- For the indicators 4.1.1 and 4.1.2 it is also recommended to draw up a climate action roadmap according to the indicator 4.1.5.

Indicator 4.1.4: five bonus points can be claimed, if the calculated value of the CO_2-e emissions for the projected building ($GWP_{C.Proj}$ results from the indicator 3) falls below the reference value for the construction ($GWP_{C.ref}$) by at least 50%. This target can be achieved by selecting the proper construction materials e.g. products made from renewable raw materials, climate-neutral concrete, etc. and precise consideration of the EoL (end of life) scenarios e.g. the possibility of reusing components, etc.

Indicator 4.1.5: “climate action roadmap” for climate-neutral operation achieved by 2040 (calculation boundary “operation”), a plausible climate action roadmap must be available for the building operation in accordance with the “framework for carbon neutral buildings and sites”. This action plan for building operation must contain the building-specific decarbonization path which brings the building operation related CO_2 emissions to zero-balance by 2040 at the latest. The action plan addresses all five focus areas: local context, building energy, use energy, supply systems and renewable energy. Purchase of the renewable energy can be included in the calculation as the last measure. The climate action roadmap for the “Operation” have to be presented to the client before the construction work began. In addition, climate action certificate for the building have to be available with all the mandatory information for the "operation" according to the "framework for carbon neutral buildings and sites" of the DGNB.

Indicator 4.1.6: "Climate protection roadmap” for climate-neutral building (calculation boundary “operation and construction"), a plausible climate action roadmap, including the construction (building materials), according to the DGNB "framework for carbon-neutral buildings and sites" is available. This action plan for building (operation plus construction) must contain the building-specific decarbonization path which brings the building related CO_2 emissions to zero-balance by 2050 at the latest. The action plan addresses all five focus areas from ind. 4.1.5 and construction related focus areas: high area sufficiency, circular construction, flexible use, low material consumption and low CO_2 intense material use, more detailed description is available under the DGNB "framework for carbon-neutral buildings and sites". Purchase of renewable energy can flow into the calculation as the last measure. The climate action roadmap for the “Operation and Construction” have to be presented to the client before the construction work began. In addition, climate action certificate for the building have to be available with all the mandatory information for the "operation" according to the "framework for carbon neutral buildings and sites" of the DGNB.

Indicator 5: Circular economy

Both the use of reused components and the provision of quantities of thermal or electrical energy for other users in excess of the internal energy demand of the building itself, can be fully included in the assessment in indicator 3 "Life cycle assessment comparison calculation". Reused components must be excluded from the recording of environmental impacts. Energy production can be incorporated into the calculation as described in the section "Module B6: Scenario for energy use in operation" (below). No bonus points are awarded here in order to prevent double awards.

Indicator 6: Halogenated hydrocarbons in refrigerants

Refrigeration systems that use refrigerants with a GWP factor ≥ 150 kg CO_2 equivalent in accordance with the schedule published by the German Federal Environment Agency (*Umweltbundesamt (UBA)*) should not be used. Such refrigerants also include substances that are still often used in building air conditioning systems such as R-134a, R-407c or R-410a. Buildings that are operated without active cooling also meet the requirements of this indicator.

More information regarding refrigerants is available here:
www.umweltbundesamt.de/en Topics› Economics | Consumption› Products› Fluorinated Greenhouse Gases and Fully Halogenated CFCs› Documents or
https://www.umweltbundesamt.de/sites/default/files/medien/2503/dokumente/global_warming_potential_gwp_of_certain_substances_and_mixtures.pdf

Description of the DGNB life cycle assessment method (indicator 3)

Criterion ENV1.1 "Building life cycle assessment" is assessed in the same way as the results of a building life cycle assessment. The results of this life cycle assessment are designated as an "Environmental profile" or "Environmental quality" of a building. A building life cycle assessment determines and evaluates the environmental quality of a building, taking into account its scheme (office building, department store, school, etc.) and compares the results with reference values. The basis used for obtaining the data must be documented and provided in order to prevent any doubt when checking the results. The building life cycle assessment should be used during the planning phase itself, where possible. It can provide an important instrument for optimising the environmental quality of the building. The basis used for calculating the building life cycle assessment is DIN EN 15978.

1. Methodological basis for the building life cycle assessment

1.1 Area of application of the building life cycle assessment

The results of a building life cycle assessment can be applied to the subject of the evaluation. Calculation rules, data requirements, the selection of environmental indicators and other aspects described below must be taken into account here. In principle, the complete life cycle of buildings must be evaluated.

1.2 Description of the evaluated building

1.2.1 Functional equivalent (subject of the evaluation)

The subject of the evaluation is the entire building, but does not include the external installations. For evaluations that only consider specific parts of a structure, the system limits of the life cycle assessment must be clearly defined.

Evaluated building must be described in terms of its material and time-dependent properties. In addition, a clear description of the technical and functional properties of the building, the building type and the scheme (e.g. the number of users) must be recorded in a documentation data sheet. Details regarding documentation are described in more detail under the point "Required documentation". Description of the evaluated building represents the functional equivalent for the evaluation.

1.2.2 Reference period t_d

The reference period t_d (also known as "Reference study period") is specified for each scheme. If the intended duration of use of the evaluated building is shorter or longer than this period, the calculation of the results can be adjusted accordingly. However, it should be noted that the way in which certain processes are viewed always stays the same, even with a duration of use that deviates from the standard; this applies, for example, for construction, demolition, etc. However, as a part of DGNB certification, the specified reference period must always be applied as an estimate in order to enable comparison with the reference values.

1.2.3 System limits of the life cycle assessment

The evaluation only applies to the building, not including any external installations. The table 1 shows which processes and phases are included in the system limit and therefore incorporated in the evaluation and which processes and phases are excluded. The designations and descriptive information from modules A to D refer to DIN EN 15978.

Table 1: DIN EN 15978 modules for lifecycle assessment

LIFE PHASES	A 1–3			A 4–5		B 1–7								C 1–4				D
	PRODUCTION PHASE			ERECTION PHASE		USE PHASE								END OF THE LIFE CYCLE				BENEFITS AND LIABILITIES OUTSIDE OF THE SYSTEM LIMITS
	RAW MATERIALS PRO-CUREMENT	TRANSPORT	PRODUCTION	TRANSPORT	EREC-TION/INSTALLATION	USE 1	MAINTENANCE 2	REPAIR	REPLACEMENT 2	MODERNISATION	ENERGY CONSUMPTION DURING OPERATION	WATER CONSUMPTION DURING OPERATION		DISMAN-TLING/DEMOLITION	TRANSPORT	WASTE RECYCLING	DISPOSAL	POTENTIAL FOR REUSE, RECOVERY AND RECY-CLING
Modules in accordance with DIN EN 15978	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Declared modules	x	x	x						(x) 4		x					x	x	x

1) Impacts due to emissions that can impact health in the interior and the environment are assigned to criteria ENV1.2 and SOC1.2

2) A scenario for the energy demand of the building in use, whereby only the energy demand recorded in the building energy performance certificate (EPC), alternatively energy performance simulation, is taken into account (module B6).

4) Only includes the manufacturing (modules A1-A3) and disposal (modules C3, C4) incl. recycling potential (module D) of the replaced product, not the replacement process itself (same as for construction process).

1.3 Calculation rules for the building model

The physical building model enables mass and energy flows to be quantified. Its link to corresponding life cycle assessment data enables the life cycle assessment indicators to be determined. In order to enable the determined mass and energy flows and the resulting indicators to be checked efficiently, the results have to be organised and documented in a structured way. The documentation of the building must be divided as follows:

- Its constituent parts (all building elements, structural parts, construction products and construction materials);
- The associated processes such as maintenance, replacement and end-of-life processes as well as reuse, recycling and energy recovery;
- Usage (of energy) during operation.

For the building model, the corresponding life cycle assessment indicators must be determined and presented separately.

In principle, there are 3 methods to create a building model, partial calculation method to create the building model, which enables very simple recording of the constituent parts of the building. Simplified calculation method, which enables main components from the building component catalogue to be recorded and the complete calculation method, which includes recording all constituent parts and their associated processes.

In each case, the use of energy during operation (module 6) in accordance with the building energy performance certificate (EPC) or alternatively building energy performance simulation must be determined and included equally in the calculation. A whole building analysis is conducted using local climate data. A reference building method is used to evaluate the building's environmental performance.
Requirements and details for EPC and energy performance simulation are listed in Appendices 2, 4 and 5.

1.3.0 Production phase (modules A1–A3), Partial calculation method (PCM)
Calculation of the production phase includes only structural components listed below:

(1) External and basement walls – perimeter insolation and only mineral / metal-based core materials e.g. concrete incl. reinforcement, concrete blocks, bricks etc. No other layers e.g. cladding, painting, plastering, adhesives etc.
(2) Roofs – perimeter insulation and only mineral / metal-based materials e.g. concrete incl. reinforcement
(3) Internal floors and ceilings – only mineral / metal-based core structures and elements e.g. concrete incl. reinforcement without floor coverings, coatings, adhesives etc.
(4) Ground-level floor – perimeter insulation and only mineral / metal-based core construction materials e.g. concrete incl. reinforcement and.
(5) Foundations[3] - only mineral / metal-based materials e.g. concrete incl. reinforcement
(6) Internal walls – only mineral / metal-based materials e.g. concrete incl. reinforcement, concrete blocks, bricks, No other layers e.g. painting, plastering, adhesives etc.
(7) Load bearing structure – all mineral / metal-based materials e.g. concrete incl. reinforcement, metal columns, beams etc.

Appendix 1 shows the building elements that must be included in detail in the form of a table.

The constituent parts of the building and associated quantities must be listed systematically and organised in accordance with Appendix 1 if possible. Created building model must be sufficiently transparent that a unit of reference can be determined for the life cycle assessment datasets (e.g. ESUCO or other verified LCA dataset), Each unit of reference for the calculated quantity of the building model must be checked to ensure that it matches the unit of the assigned life cycle assessment dataset and adjusted to match if necessary (e.g. via density or weight per unit area).

Determination of quantities for the production phase should be carried out and documented as follows:
For the elements in (1), (2), (3), (4), (5) (6) and (7), total masses of concrete, (incl. reinforcement) concrete blocks and/or structural metal components, must be determined and documented accordingly. No layer structures must be calculated, except the perimeter insulation (building envelope) e.g. mineral wool boards, plastic foam insulating materials etc.

Transportation to the construction site is not to be included and products, processes and expenditure that do not relate to construction site work are likewise not to be taken into account. This also applies to preparatory work and soil excavation. In addition, losses when installing elements can be ignored; it is not necessary to calculate the gross total of the elements.

The building model for construction must be linked to life cycle assessment datasets. If there is no life cycle

[3] Retaining walls or other shoring methods must be included as estimates in the life cycle assessment if they remain as permanent parts of the structure. However, if they remain in the construction ground but are separate from the structure, they are not taken into account.

assessment data that precisely matches a component, a technically similar life cycle assessment dataset must be used. If there are multiple similar datasets available, a conservative approach must be selected (worst-case scenario principle).

Please note: If determination of quantities is carried out using the partial calculation method, the indicator results for the production phase, maintenance and replacement as well as for end-of-life must be multiplied by a **factor of 1.4**. If comprehensive passive measures are taken into account and recognised in criterion TEC1.4, indicator 1, the factor of 1.4 for the partial method can be reduced to a factor of 1.35 for passive buildings.

1.3.1 Production phase (modules A1–A3), simplified calculation method

Calculation of the production phase includes the calculation of the following structural and technical components listed below:

(1) External walls (including doors and windows) and basement walls
(2) Roofs
(3) Internal floors and ceilings (including floor structures and floor coverings and coatings)
(4) Ground-level floor (including floor construction and floor coverings and coatings, as well as floors above open space)
(5) Foundations[4]
(6) Internal walls and doors (including coatings and internal columns)
(7) Heating and cooling systems and air conditioning systems
(8) Other building installations (e.g. photovoltaic systems or the use of solar collectors)
(9) In individual cases: User equipment with considerable energy consumption in the use phase (if suitable life cycle assessment data is available for them, such as refrigerated counters and cold storage rooms), these can be described in more detail depending on their usage here.

Appendix 1 shows the building elements that must be included in detail in the form of a table.

The constituent parts of the building and associated quantities must be listed systematically and organised in accordance with Appendix 1 if possible. Created building model must be sufficiently transparent that a unit of reference can be determined for the life cycle assessment datasets (e.g. ESUCO or other LCA dataset), Each unit of reference for the calculated quantity of the building model must be checked to ensure that it matches the unit of the assigned life cycle assessment dataset and adjusted to match if necessary (e.g. via density or weight per unit area).

Determination of quantities for the production phase should be carried out and documented as follows:

- For the elements in (1), (2), (3), (4), (5) and (6), the results of the layer structures must be calculated with the corresponding area as a whole, and listed separately. Alternatively, total masses (e.g. concrete in the external walls) can be determined and documented accordingly.
- For elements (1), (2) and (5), the results of the layer structures must be calculated with the corresponding total surface area of the building as a whole, and listed separately. For windows/doors/gates/floor and ceiling structures or other structural installations, the calculations must be listed with an appropriate level of detail. Simplifications must be documented, and at least 90% of the masses or all significant layers of each structural element must be recorded.

[4] Retaining walls or other shoring methods must be included as estimates in the life cycle assessment if they remain as permanent parts of the structure. However, if they remain in the construction ground but are separate from the structure, they are not taken into account.

- For (7), the following applies: The creation of heating and cooling systems and the central units of air conditioning systems must be included in the building model. Pipes, lines, ducts and other systems that are part of the technical building equipment (BE) must not be included in the building model for simplified analysis.
- For (8), the following applies: The production of other building installations (PV, solar collectors, etc.) must be included in the overall calculation. If there are no life cycle assessment data sets available for this purpose, this must be indicated and explained in the project report. Small components such as switches, etc. are an exception to this.
- For (9), the use-specific specifications in Appendix 1 apply (currently, only refrigerated counters in the retail sector are to be recorded).

In order to simplify the creation of the building model, average values for similar building components or layer structures can be used in a corresponding ratio. These must reflect the actual use in the building. The use of simplifications must be disclosed and documented. Any constituent parts of the building that are required here but not recorded in the building model must be documented. Transportation to the construction site is not to be included and products, processes and expenditure that do not relate to construction site work are likewise not to be taken into account. This also applies to preparatory work and soil excavation. In addition, losses when installing elements can be ignored; it is not necessary to calculate the gross total of the elements.

The building model for construction must be linked to life cycle assessment data sets. If there is no life cycle assessment data that precisely matches a component, a technically similar life cycle assessment data set must be used. If there are multiple similar data sets available, a conservative approach must be selected (worst-case scenario principle).

Please note: If determination of quantities is carried out using the simplified calculation method, the indicator results for the production phase, maintenance and replacement as well as for end-of-life must be multiplied by a **factor of 1.2**. If comprehensive passive measures are taken into account and recognised in criterion TEC1.4, indicator 1, the factor of 1.2 for the simplified method can be reduced to a factor of 1.1 for passive buildings.

1.3.2 Production phase (modules A1–A3), complete calculation method

Structural work and fit-out must be incorporated into the calculation for the life cycle assessment values for construction of the building as though constructed. Structural and technical components must be ordered in accordance with the Appendix 1.

All materials that fulfil at least one of the following conditions (cut-off criteria) have to be taken into account:

- Materials that make up more than 1% of the total mass of the building. In total, the ignored materials/material groups must not make up more than 5% of the mass of the entire building.
- The following applies to plastics and products made from renewable raw materials: The total primary energy demand (PEtot) of the material is more than 2% of the total primary energy demand of the building (only construction, incl. production, maintenance and end-of-life). In total, the ignored materials/material groups must not make up more than 5% of the total primary energy demand of the building.
- The following applies to coatings: The summer smog potential (POCP) is greater than 2% of the summer smog potential of the building. In total, the ignored materials/material groups must not make up more than 5% of the summer smog potential of the building.

The completeness of the determination of quantities must be verifiably demonstrated and proven (see above). To do so, rough relevance estimations must be made for ignored materials.

Construction site work, waste and waste disposal on the construction site can be ignored in the same way as in the simplified process. The same applies for transportation, preparatory work and soil excavation.

The construction model must be linked to life cycle assessment data sets. If there is no life cycle assessment data that precisely matches a component, a technically similar life cycle assessment data set must be used. If there are multiple similar data sets available, a conservative approach must be selected (worst-case scenario principle).

1.3.3 Use scenario calculation method (modules B6, B4)

Supply and disposal systems and repair must be included in the calculation of the life cycle assessment values for use of the building. The appropriate value for the scheme must be considered as the reference period t_d. Calculations and results should be organised in compliance with criterion ECO1.1.

The calculation comprises the following modules:

- Module B6: Energy demand of the building in use, whereby only the final energy demands recorded in EPC alternatively, results from energy demand simulation are taken into account;
- Module B4: replacement, including construction and end-of-life phase;

Module B6: Scenario for energy use in operation

The values for the final energy demand of the various/individual energy sources for operation of the building can be found in the EPC calculation, details described in Appendix 2 (the country specific statutory requirements regarding the energy performance of buildings will be taken in to the consideration if there is a sufficient compliance with the calculation/simulation standards described in Appendix 2)[5]. Here, it must be ensured that the final and non-primary energy values are incorporated into the calculation. The calculated energy demand must refer to the NFAs (net floor area) in accordance with the T&D_04, i.e. not to the conditioned/heated area based on EPC. Alternatively, results from a building energy performance simulation can be used for the actual building. When doing so, a calculation in accordance with specified standard parameters is required. These are described in Appendices 2, 4 and 5.

From the relevant LCA datasets (e.g. ESUCO, CHISUCO or country specific datasets[6]) **electricity mix** should be used as a basis for the life cycle assessment values of the estimated **electricity demand**. Purchase of the green electricity cannot be assessed in the schemes for the new building. Proportions of green electricity in the average electricity mix have already been taken into account.
The following applies to cases where energy is fed into the grid or generated for internal demand from building systems (photovoltaic systems, cogeneration units): The energy generated can be deducted from the building energy demand. The following should be noted here:

- The proven electricity demand may already be calculated in the EPC calculation by taking into account the internal use of electricity from installations that generate electricity. In this case – in the case of electricity generation from a PV system – for instance, the renewable primary energy demand and the total energy demand of the building would be incorrectly reduced. This must be corrected. Where the electricity production for internal use from a cogeneration unit is taken into account, all life cycle assessment indicators must be corrected accordingly.
- In all cases, it is necessary to state whether or not the energy production in building systems has been taken into account in the calculation of the energy demand and to include this accordingly in the calculation of the life cycle assessment results.
- In the case of extensive electricity production to reduce internal electricity demand from the grid and

[5] Country specific energy performance certificate (statutory regulation) must be fulfilled and consulted with DGNB.

[6] Use of the country specific LCA datasets for energy, to be agreed with DGNB.

to feed excess electricity into the grid, the net value of the electricity balance and similarly the total values of the life cycle assessment indicators can become negative. This corresponds to an energy-positive building (relating to the building operation). These results are valid only for the considered building. Extrapolation of these results across the market is not covered by the methodological framework of the life cycle assessment (particularly attributional life cycle assessment).

A clear list of the estimated gains must be attached to the calculations as an appendix.
The life cycle assessment values for additional energy sources, e.g. for covering the **heating demand**, are to be determined as follows: The method of heat generation must be specified and the corresponding LCA dataset must be used. Use datasets e.g. ESUCO already partially include losses from combustion efficiency rates (Q_G). These efficiency rates/losses are documented accordingly in the dataset.

The following approach applies to the use of **long-distance district heating** if no situation-specific long-distance district heating life cycle assessment dataset is available:

- If the energy supplier can demonstrate a proportion of renewable in the long-distance district heating. (but not the primary energy factor), this is estimated by the dataset for the secondary fuel combustion (if not available, by means of a dataset for industrial-scale wood combustion). The non-renewable proportion of long-distance district heating is linked to the corresponding LCA dataset e.g. ESUCO, long-distance district heating datasets represent the mix of non-renewable long-distance district heating. The size of the renewable proportion of the long-distance district heating provided by the supplier must be proven with a corresponding certificate or statement from the supplier. Regenerative sources of long-distance district heating include biomass, biogas, sewage gas, landfill gas and solar thermal energy.

When using **geothermal energy, PV systems, solar collectors or cogeneration units**, the following applies:

- The auxiliary energy shown in the energy certificate normally contains the electricity demand for the operation of a heat pump. In this case, the renewable energy in the form of geothermal energy must also be considered as renewable primary energy. If the energy certificate does not show the electricity demand of the heat pump, it is necessary to use a suitable heat pump data set (which must contain both the electricity demand and the renewable energy in the form of geothermal energy).
- Process for assessing an electrical heat pump: The electricity demand of the heat pump (final energy) specified in the EPC and the electricity mix life cycle assessment dataset can be used to determine the environmental impact potentials from operation of the heat pump as a first step. As a second step, the generated renewable energy (PEr) is determined by then multiplying the electricity demand of the heat pump (final energy) specified in the energy certificate by the Seasonal Performance Factor (SPF) of the heat pump.
- It is permissible to use life cycle assessment datasets for electrical brine water heat pumps for calculating deep geothermal energy.
- Only the generated renewable energy can be additionally taken into account for assessing photovoltaic systems and solar collectors in operation.
- It is permissible to use life cycle assessment datasets for gas condensing boilers for calculating the heat production of cogeneration units. In order to adequately take a small cogeneration unit, including electricity supply, into account, specific calculation of the cogeneration unit is recommended, and in any case the impact of the electricity production in the cogeneration unit must be taken into account. The allocation of the impacts must be carried out in accordance with the energy content of the products (to ensure consistency with LCA datasets).

If the energy production cannot be represented directly using LCA datasets, a project-specific calculation must be carried out, or, if this is not possible, a suitable conservative estimation with a comparable available dataset must be made. Selected method must be argued and documented. Alternatively, as a preferred variant, an Environmental Product Declaration (EPD) in accordance with DIN EN ISO 14025 and DIN EN 15804 for the specific method of energy production can be used.

The use of **waste heat from industrial processes** can be incorporated into the calculation separately, i.e. without including emissions and resource expenditure, if it can be proven that this waste heat is not used for any other purpose. The use of waste heat from industrial-scale waste incineration plants is an exception to this rule, and must be considered in accordance with the rules for long-distance district heating (see above).

Module B4: Scenario for replacement

Expected durations of use for components can be found in the following data sources:

- Construction materials/construction products and technical installations: ”Guideline for sustainable buildings” on behalf of Ministry of Transport, Building and Housing, Germany 2001, or from corresponding information for the reference durations of use from Environmental Product Declarations (EPD) in accordance with DIN EN 15804.

Calculations for replacement must be carried out for all materials and components or surfaces with duration of use smaller than the reference period t_d. The frequency of replacement of components/products after their expected duration of use is determined assuming replacement with the component/product that was originally used in the calculations. For this calculation, only complete (integer) replacement is permitted (no partial replacements). The frequency of replacement is determined by dividing the reference period by the expected duration of use of the component/product. In the event of a calculated partial replacement (non-integer values), the resulting value must be rounded up. For this process, it is important to ensure that the technical framework conditions of the replacement are calculated as realistically as possible. This applies above all to the accessibility of components that may require additional layers to be removed and replaced.

The frequency of replacement is determined as follows:

$$n_{Replacement} = \text{rounded up } (t_R/t_D) - 1 \quad [-]$$

where

- $n_{Replacement}$: Frequency of replacement; if the result is a decimal (partial replacement), the result must be rounded up to the next whole number
- t_R: Reference period [a]
- t_D: Duration of use of a component in [a]

The recovery and disposal of the replaced components/products must be calculated in a suitable quantity with the appropriate "end-of-life data sets" and recorded in the overall assessment (see Calculation method for end-of-life phase scenario). Transportation to the construction site and to recovery and disposal facilities is to be ignored.

The plausibility of the approaches must be demonstrated. It must be ensured that the assumptions made are the same as those made for the calculation of the irregular maintenance costs for life cycle costs.

Please note: If determination of quantities is calculated using the partial calculation method calculation method, the indicator results for the scenario for maintenance and replacement must be multiplied by a **factor of 1.4**. If comprehensive passive measures are taken into account and recognised in criterion TEC1.4, indicator 1, the factor

of 1.4 for the partial method can be reduced to a factor of 1.35 for passive buildings. If determination of quantities is carried out using the simplified calculation method, the indicator results for the scenario maintenance and replacement must be multiplied by a factor of 1.2. If comprehensive passive measures are taken into account and recognised in criterion TEC1.4, indicator 1, the factor of 1.2 for the simplified method can be reduced to a factor of 1.1 for passive buildings.

1.3.4 Calculation method for end-of-life phase (modules C3, C4) and benefits and liabilities outside of the system limits (module D)

Recovery and disposal of all materials/construction materials listed in the production phase must be included in the calculation of the life cycle assessment results for the end-of-life scenario (EoL) for the building. To simplify this process, the calculation can also be carried out for groups of materials with the same EoL scenario.

Materials must be divided into the following material groups for the calculations and evaluations:

(1) Metals for recovery
(2) Mineral materials for recovery
(3) Materials for thermal recovery (with a calorific value, e.g. wood, plastics, etc.)
(4) Materials that can only be deposited at a landfill
(5) Heating and cooling systems and air conditioning systems[7]

- For (1), the following applies: The disposal/recycling path "Recycling/recovery" must be selected. The datasets for the corresponding "metal recycling potential" that contain modules C and D must be selected. Precise allocation must be ensured. If an unambiguously suitable dataset is not available, a similar dataset must be selected. It should be noted that only metals with proportions produced via primary manufacturing can be demonstrated as having a recycling potential corresponding to such proportions (this is usually found in EoL datasets calculated in accordance with DIN EN 15804). If a product consists entirely of recycled material, no further recycling potential can be assessed (e.g. reinforcing steel).
- For (2), the following applies: The disposal/recycling path "Recycling/recovery" must be selected. The process "Construction rubble reprocessing" (part of module C) must be selected for mineral materials that are demonstrably usually recoverable (materials such as concrete used for backfilling in road or landfill construction) and must be linked to a credit note (negative dataset) for a corresponding quantity of gravel (part of module D).
- For (3), the following applies: The disposal option "Thermal recovery" must be selected. The datasets can be summarised by material groups (wood, wooden materials, plastics, etc.) and must be represented with the corresponding datasets for thermal recovery. Documentation is carried out in module C4 (in the event of thermal recovery without energy generation) or in module C3 and D if thermal recovery with energy generation can be applied (in accordance with the definition of the dataset).
- For (4), the following applies: The recycling path "Disposal at landfill" must be selected if no other recovery option aside from depositing at a landfill is typically used for the materials. This applies, for instance, to glass, mineral wool, bitumen sheeting, plasterboard, etc. Suitable datasets or mixed material datasets must be selected for this. The results are part of module C.
- For (5), the following applies: The dataset that corresponds to the production must be assessed. Here, it is important to ensure the correct scaling of the quantities and the correct unit of reference for the life cycle assessment datasets used (same as the statements listed under "Construction").

[7] Not included in the PCM

- Where the building service installations are taken into account in detail in the life cycle assessment, suitable EoL scenarios must be provided accordingly. Here, it is recommended to fractionate the material mix of building service installations to enable the use of available EoL scenarios and datasets.

Note 1: If determination of quantities is calculated using the partial calculation method, the indicator results for the EoL scenario must be multiplied by a **factor of 1.4** (see above). If comprehensive passive measures are taken into account and recognised in criterion TEC1.4, indicator 1, the factor of 1.4 for the partial method can be reduced to a factor of 1.35 for passive buildings. If determination of quantities is calculated using the simplified calculation method, the indicator results for the EoL scenario must be multiplied by a **factor of 1.2** (see above). If comprehensive passive measures are taken into account and recognised in criterion TEC1.4, indicator 1, the factor of 1.2 for the simplified method can be reduced to a factor of 1.1 for passive buildings.

Note 2: If EoL scenarios are taken from EPDs for specific construction products, it must be ensured that multiple alternative scenarios can be specified in EPDs. Generally, a standard scenario is defined that reflects the normal recycling path. This standard scenario can be used even if it deviates from the specifications given above for the EoL scenario that is to be applied. However, this requires that the specific installation location of the product supports the scenario. (Example: A standard scenario of an EPD assumes that the product is installed such that it can be removed, e.g. that it is screwed in place. However, if the product is glued in place in the specific project in question, it may no longer be available for the standard EoL scenario. In this case, a suitable EoL scenario must be used.)

Note 3: The available EoL datasets are generally differentiated in less detail than manufacturing datasets for construction materials (this also applies to generic datasets). As recovery of construction materials using up-to-date methods is rarely carried out on a product-specific basis, but is instead often carried out by fractionating the demolition material into product groups, it is appropriate and sufficiently precise to represent the EoL with a small number of average datasets. For product-specific recovery methods, e.g. due to an established recovery system, it is possible to refer to corresponding EPDs incl. data for the EoL.

1.4 Requirements for data

1.4.1 Data for the building life cycle assessment

In principle, specific and verified life cycle assessment data (e.g. Environmental Product Declaration, EPD) should be preferred over general, generic life cycle assessment data. The DGNB provides DGNB Auditors and Consultants with access to the following LCA databases which include both generic and specific data:

- European Sustainable Construction Database ESUCO
- Chinese Sustainable Construction Database CHISUCO

These databases are suited to the scope and purpose of the LCA calculations. They are consistent in their methodology and provide the required results for each indicator. The methodological consistency, conformity and completeness of specific data from other sources must be verified by independent external experts. These requirements are fulfilled by EPD type III declarations according to ISO 14025 and DIN EN 15804.
The use of manufacturer-specific data sets for products that are not used in the building is only permitted in justified exceptional cases and only if a safety margin of at least 10% is added to the DGNB life cycle assessment indicator results in order to take into account possible deviations in the data sets used. As a general rule, preference should be given to datasets which most precisely reflect the item in question (materials, end-of-life scenario, energy supply, etc.) in terms of technical relevance and assessment date, e.g. generic datasets for design phase assessment, product-specific EPD for final documentation.
Please note: This safety margin is not to be confused with the 20% margin (factor of 1.2) for building construction

that must be applied when using the calculation rules for the simplified calculation method (taking into account only selected constituent parts of the building) (see above).

For other general (generic) data that has not been checked externally, a calculation margin ("safety margin") must be included in the calculations in order to compensate for the possibility of data that does not accurately reflect reality. For classification of such datasets with regard to their quality and representativeness, it is possible to refer to e.g. ESUCO dataset.

The following applies as a general rule for selecting datasets: The dataset must be selected that most accurately represents (in terms of materials, end-of-life scenario, energy supply, etc.) the subject of the assessment (material or component), with reference to conformity to technical specifications and time of assessment (e.g. general data for the concept analysis, company-specific EPDs for final documentation). Project-specific life cycle assessment data that has not been subject to any external verification in accordance with DIN EN 15804 can only be used subject to certain conditions (see "Required documentation").

1.4.2 Data quality and requirements regarding completeness of life cycle assessment data

It is possible to select both aggregate data for assembled components or entire systems such as walls, roof systems, etc. and product-specific or material-specific data for components. In all cases, the data must be representative, regardless of whether it consists of general life cycle assessment data, average values or manufacturer-specific life cycle assessment data. LCA data other than that provided in ESUCO database must match the methodological standards, quality and completeness set by EN 15804 standard and this must be documented comprehensively for verification.
If EPDs are used, these must be in accordance with DIN EN 15804 and must be valid at the time the product is used (or at the time of the decision to purchase the product). Datasets with expired validity can only be used in justified exceptional cases.

Please note: EPDs in accordance with DIN EN 15804 have a validity period of 5 years, but the validity can be extended if necessary in individual cases.

When using data or EPDs not nominally in accordance with DIN EN 15804, it must be ensured that the data or EPDs comply with the same methodological specifications as ESUCO database in terms of quality and completeness.

The cut-off criteria for life cycle assessment data sets must comply with the requirements of DIN EN 15804 and/or with the methodological standards set by ESUCO database.

Note:
DGNB Auditors and Consultants should consult with DGNB if no adequate LCA datasets are locally available.

1.5 Report and presentation of the results

A short project report must be created (see "Required documentation") and information to ensure transparency of the creation of the building model must be provided. The life cycle assessment results must be presented in accordance with the documentation specifications. When doing so, the indicators and parameters listed in the descriptions of the criteria must be evaluated.

The life cycle assessment **results must be presented with reference to a period of one year and one m² NFAs, excluding driving lines in underground garages**. This must be implemented consistently across all criteria of the life cycle assessment. In the verification documentation, the NFAs must be presented separated into usable area (UA), circulation space (CS) and technical plant areas (TPA) for each storey, and the vehicle parking areas must be

presented separately from the driving lanes for underground garages. All area calculations must be carried out in accordance with the [T&D_04].

The following applies to industrial buildings: For buildings with ≤ 12 m clear room height, an approach using area in m^2 NFAs must be used. For buildings with > 12 m clear room height, the assessment must be carried out with reference to gross volume GV in m^3 BRI. The gross volume must be calculated in accordance with the [T&D_04].

2. Methodological basis for the building life cycle assessment

The evaluation includes optimisation of the emissions for construction and operation at the same time throughout the entire life cycle. The determined values are specified as an indicator result relating to the net volume NV: Indicator result in [kg environmental impact equivalent/(m^2NFAs*a)][8]. They are calculated as an average annual value for the building and compared to reference values for assessment. Lower values for the emissions equivalents correspond to lower potential environmental impacts. The calculation method described below must be carried out separately for each environmental impact indicator.

2.1 Life cycle assessment results for the actual building

The environmental impacts of the constructed building are summarised as a shared parameter in the form of an environmental impact potential (EIP) as an average annual value across the reference period considered for assessment of the indicators:

$$\mathbf{EIP_T = EIP_C + EIP_U} \qquad \mathbf{(1)}$$

where

- EIP_T Total resulting environmental impact potential for construction (C) and use (U) of the building in [kg environmental impact equivalent/(m^2_{NFAs}*a)]
- EIP_C Resulting environmental impact potential during construction, replacement, recovery and disposal of the building including the technical facilities used as an annual average value over the reference period considered for the certification t_d of in [kg environmental impact equivalent/(m^2_{NFAs}*a)]
- EIP_U Predicted annual environmental impact potential for **operation** of the implemented building, derived from the final energy demand in accordance with EPC (or standardised energy simulation) plus the environmental impact potential for the user equipment during building operation, derived from the final energy demand of the defined facilities (insofar as required under "Usage-specific description of the method") in [kg environmental impact equivalent/(m^2_{NFAs}*a)]

The average annual value for the **construction EIP_C** is determined as follows:

$$\mathbf{EIP_C = (P + D + M) / t_d} \qquad \mathbf{(2)}$$

where

- P Predicted value for the environmental impact potential resulting from **production** (building construction and technical facilities) for the implemented building in [kg environmental impact equivalent/(m^2_{NFAs})]
- D Predicted value for the environmental impact potential resulting from **recovery and disposal** (building construction and technical facilities) for the implemented building in [kg environmental impact equivalent/(m^2_{NFAs})]

[8] The total primary energy demand and non-renewable primary energy demand indicators are specified in [MJ/(m^2_{NFAs}*a)] and the water demand indicator is specified in [m^3/(m^2_{NFA}*a)].

- M Predicted value for the environmental impact potential resulting from **replacement** (building construction and technical facilities) for the implemented building in [kg environmental impact equivalent/(m^2_{NFAs}*a)]
- t_d **Reference period** considered for the certification in [a].

The average annual value for the **use EIP_U** is determined as follows:

$$EIP_U = EIP_{UE} + EIP_{UH} + EIP_{UF} \quad (3)$$

where

- EIP_{UE} Environmental impact potential of the **electricity demand during use**, calculated in accordance with EPC (or standardised energy simulation), multiplied by the EIP factor of the electricity mix from the relevant LCA dataset in [kg environmental impact equivalent/(m^2_{NFAs}*a)]
- EIP_{UH} Environmental impact potential of the **heating and, where applicable, cooling demand during use**, calculated in accordance with EPC (or standardised energy simulation), multiplied by the EIP factor of the selected energy source from the relevant LCA dataset in [kg environmental impact equivalent/(m^2_{NFAs}*a)]
- EIP_{UF} Only for selected schemes: Predicted annual environmental impact potential for the **user equipment during building operation**, derived from the final energy demand of the defined facilities in [kg environmental impact equivalent/(m^2_{NFAs}*a)]

2.2. Reference values for the building life cycle assessment

The reference values (30 and 40 sub-points) for the environmental indicators (EIP_{Gref}) are generally derived from

- a fixed proportion for the construction-related value of the environmental impacts of emissions for construction, maintenance and recovery/disposal, as well as
- a variable proportion for the use-related value of the environmental impacts of emissions at the level of the reference building used as a basis in EPC (or standardised energy simulation). The variable proportion is calculated from the electricity and heating demand (final energy) determined in accordance with EPC (or standardised energy simulation), multiplied by defined factors (values of the environmental profiles for the electricity mix and a representative thermal energy mix).

$$R_{EIP} = EIP_{Gref} = EIP_{Cref} + EIP_{Uref} \quad (5)$$

where

- EIP_{Cref} Reference value for the annual average value of the environmental impact potential for **construction, replacement, recovery and disposal** of the building including the technical facilities used across the reference period considered t_d, in [kg environmental impact equivalent/(m^2_{NFAs}*a)]
- EIP_{Uref} Reference value for the annual environmental impact potential resulting from **operation** of the building, derived from the final energy demand of the reference building in accordance with EPC (or standardised energy simulation) or – for selected schemes – reference value for the annual environmental impact potential resulting from the **user equipment** during building operation, derived from the final energy demand of the defined facilities in [kg environmental impact equivalent/(m^2_{NFAs}*a)]

The reference values for the **construction EIP_{Cref}** are determined as follows:

EIP_{Cref} = constant (6)

The EIP_{Cref} values are determined using parameters derived from statistical studies.

The reference values for the **use EIP_{Uref}** are determined as follows:

$EIP_{Uref} = EIP_{UEref} + EIP_{UHref} + EIP_{UFref}$ (7)

where

- EIP_{UEref} Environmental impact potential of the annual **electricity demand (final energy) of the reference building** in accordance with EPC (or standardised energy simulation) in [kg environmental impact equivalent/(m^2_{NFAs}*a)]
- EIP_{UHref} Environmental impact potential of the annual **heating and, where applicable, cooling demand**
  (final energy) of the reference building in accordance with EPC (or standardised energy simulation) in [kg environmental impact equivalent/(m^2_{NFAs}*a)]
- EIP_{UFref} only for selected schemes: Reference value for the
  annual environmental impact potential of the **user equipment during building operation**, derived from the final energy demand of the defined facilities in [kg environmental impact equivalent/(m^2_{NFAs}*a)]

The calculation of the final energy demand is based on either Building EPC or a standardised energy simulation.

The reference period t_d is 50 years. A reference period of 20 years must be selected for the **Production** and **Logistics** schemes.

The following influencing parameters have already been taken into account in the conversion table (reference):
For the construction-related value of the environmental impacts of emissions and resource demands:

(1) Relevant statistical research for manufacture, maintenance, and end-of-life phases.
(2) Results of the DGNB certifications
(3) Long-term objective of the DGNB for the environmental indicators

For the use-related value of the environmental impacts of emissions:

(4) Current factors for electricity environmental profile and representative mix for thermal energy

Life cycle assessment results for the actual building and reference values

The achieved values and the reference values must be determined in accordance with the "General description of the evaluation method".

Table 2: Reference values for construction, maintenance and recovery/disposal ("construction") as well as use: GWP, ODP, POCP, AP, EP

	GWP	ODP	POCP	AP	EP
Unit	[kg CO_2 equiv./(m^2_{NFAs}*a)]	[kg R11 equiv./(m^2_{NFAs}*a)	[kg C_2H_4 equiv./(m^2_{NFAs}*a)]	[kg SO_2 equiv./(m^2_{NFAs}*a)]	[kg PO_4^3 equiv./(m^2_{NFAs}*a)]
Office **Education** **Residential** **Hotel** **Consumer markets** **Shopping centre** **Department store** **Assembly buildings** Type I Construction **Logistics** **Production** **Assembly buildings** Type II Construction (per m³ BRI) **Logistics** **Production** **Assembly buildings** Type II Construction (per m²NFAs)	GWP_{Cref} = 9.4	ODP_{Cref} = 5.3 * 10^{-7}	$POCP_{Cref}$ = 0.0042	AP_{Cref} = 0.037	EP_{Cref} = 0.0047
	GWP_{Cref} = 1.2/(m^3_{BRI}*a)	ODP_{Cref} = 1.9 * 10^{-8} /(m^3_{BRI}*a)	$POCP_{Cref}$ = 0.0005 /(m^3_{BRI}*a)	AP_{Cref} = 0.003 /(m^3_{BRI}*a)	EP_{Cref} = 0.0004 /(m^3_{BRI}*a)
	GWP_{Cref} = 12/(m^2_{NFAs} *a)	ODP_{Cref} = 1.9 * 10^{-7} /(m^2_{NFAs} *a)	$POCP_{Cref}$ = 0.005/(m^2_{NFAs} *a)	AP_{Cref} = 0.03/(m^2_{S} $_{NFAs}$ *a)	EP_{Cref} = 0.004/(m^2_{NFAs} *a)
Use	GWP_{Uref} = GWP_{UEref} + GWP_{UHref} + $GWP_{UF,ref}$	ODP_{Uref} = ODP_{UEref} + ODP_{UHref} + $ODP_{UF,ref}$	$POCP_{Uref}$ = $POCP_{UEref}$ + $POCP_{UHref}$ + $POCP_{UF,ref}$	AP_{Uref} = AP_{UEref} + AP_{UHref} + $AP_{UF,ref}$	EP_{Uref} = EP_{UEref} + EP_{UHref} + $EP_{UF,ref}$
	where	where	where	where	where
	GWP_{UEref} = GWP factor el.mix * E_{ref} GWP_{UHref} = GWP factor heat * H_{ref}	ODP_{UEref} = ODP factor el.mix * E_{ref} ODP_{UHref} = ODP factor heat * H_{ref}	$POCP_{UEref}$ = POCP factor el.mix * E_{ref} $POCP_{UHref}$ = POCP factor heat * H_{ref}	AP_{UEref} = AP factor el.mix * E_{ref} AP_{UHref} = AP factor heat * H_{ref}	EP_{UEref} = EP factor el.mix * E_{ref} EP_{UHref} = EP factor heat * H_{ref}
Office **Education** **Residential** **Hotel** **Consumer markets** **Shopping centre**	$GWP_{UF,ref}$ = 0	$ODP_{UF,ref}$ = 0	$POCP_{UF,ref}$ = 0	$AP_{UF,ref}$ = 0	$EP_{UF,ref}$ = 0

Department stores **Assembly buildings** Type I and II					
Consumer markets **Shopping centre** **Department stores**	GWP_{UFEref} = GWP factor el.mix * E_{UFref}	ODP_{UFEref} = ODP factor el.mix * E_{UFref}	$POCP_{UFEref}$ = POCP factor el.mix * E_{UFref}	AP_{UFEref} = AP factor el.mix * E_{UFref}	EP_{UFEref} = EP factor el.mix * E_{UFref}

where

- E_{ref} Electricity demand (final energy) of the reference building in accordance with EPC (or standardised energy simulation) in [kWh/(m^2_{NFAs} *a)]
- H_{ref} Heating demand (final energy) of the reference building in accordance with EPC (or standardised energy simulation) in [kWh/(m^2_{NFAs} *a)]
- E_{UFref} Electricity demand of the user equipment in [kWh/(m^2_{NFAs} *a)]
- GWP, ODP, POCP, AP and EP factors for electricity mix and heat coming from the LCA datasets ESUCO/CHISUCO, or alternatively in any other LCA dataset which complies with the ISO 14025 and DIN EN 15804. The external datasets must be agreed with DGNB in system adaptation process.

Table 3: Reference values for construction, maintenance and recovery/disposal ("construction") as well as use: PEnr, PEtot and PEr/PEtot ratio

	PE_{NR}	**PE_{TOT}**	**PE_R/PE_{TOT}**
Unit	[MJ/(m^2_{NFAs}*a)]	[MJ/(m^2_{NFAs}*a)]	[%]
Office **Education** **Residential** **Hotel** **Consumer markets** **Shopping centre** **Department stores** **Assembly buildings** Type I and II			
Construction	$PE_{nr,Cref}$ = 123	$PE_{tot,Cref}$ = 151	[-]
Logistics **Production**			
Construction (per m³ BRI)	$PE_{nr,Cref}$ = 12.3	$PE_{tot,Cref}$ = 13.7	[-]
Logistics **Production**			
Construction (per m² NFAs)	$PE_{nr,Cref}$ = 123	$PE_{tot,Cref}$ = 137	[-]
Use	$PE_{nr,Uref}$ = ($PE_{nr,UEref}$ + $PE_{nr,UHref}$ + $PE_{nr,UFref}$) where $PE_{nr,UEref}$ = factor $PE_{nr,E}$ MJ * E_{ref} kWh $PE_{nr,UHref}$ = factor $PE_{nr,H}$ MJ * H_{ref}	$PE_{tot,Uref}$ = ($PE_{tot,UEref}$ + $PE_{tot,UHref}$ + $PE_{tot,UFref}$) where $PE_{tot,UEref}$ = factor $PE_{tot,E}$ MJ * E_{ref} kWh $PE_{tot,UHref}$ = factor $PE_{tot,H}$ MJ * H_{ref}	[-]

	kWh	kWh	
Office **Education** **Residential** **Hotel** **Consumer markets** **Shopping centre** **Department stores** **Assembly buildings**			
Type I and II	$PE_{nr,UFref} = 0$	$PE_{tot,UFref} = 0$	
Consumer markets **Shopping centre** **Department stores**	$PE_{nr,UFref}$ = factor $PE_{nr,E}$ MJ * E_{UFref} kWh	$PE_{tot,UFref}$ = factor $PE_{tot,E}$ MJ * E_{UFref} kWh	
All building types:			15% (use and construction)

where

- E_{ref} Electricity demand (final energy) of the reference building in accordance with EPC or from a standardised thermal energy simulation in [kWh/(m^2_{NFAs}*a)]
- H_{ref} Heating demand (final energy) of the reference building in accordance with EPC or from a standardised thermal energy simulation in [kWh/(m^2_{NFAs}*a)]
- E_{UFref} Electricity demand of the user equipment in [kWh/(m^2_{NFAs}*a)]
- factor $PE_{nr,E}$ Primary energy (not renewable) for electricity from relevant LCA dataset (e.g. ESUCO, CHISUCO, national etc.)
- factor $PE_{tot,E}$ Primary energy (total) for electricity from relevant LCA dataset (e.g. ESUCO, CHISUCO, national etc.)
- factor $PE_{nr,H}$ Primary energy (not renewable) for heat from relevant LCA dataset (e.g. ESUCO, CHISUCO, national etc.)
- factor $PE_{tot,H}$ Primary energy (total) for heat from relevant LCA dataset (e.g. ESUCO, CHISUCO, national etc.)

Note: all national or global (beside ESUCO and CHISUCO) LCA datasets must be in compliance with the ISO 14025, DIN EN 15804 and must be agreed with DGNB in system adaptation process.

Limit value and target value calculation

Limit values G and target values Z, which are also required for evaluation of the criterion, are generally defined as a factor applied to the reference values for the various environmental impact potentials, expressed mathematically as follows:

$$G_{EIP} = X_{EIP} * R_{EIP}$$
$$Z_{EIP} = Y_{EIP} * R_{EIP}$$

The associated variables X and Y must be formulated for the various environmental indicators as shown in Table 4.

Table 4: Target and limit values of the various environmental indicators

LIMIT AND TARGET VALUE	GWP	POCP	AP	EP	PE_{NR}	PE_{TOT}	PE_R/PE_{TOT}	ODP	LS	ADP_E
X	1.4	2.0	1.7	2.0	1.4	1.4	5%	-	-	-
Y	0.7	0.7	0.7	0.7	0.7	0.7	30%	-	-	-
Y+ (overfulfil-ment)	0.55	0.55	0.55	0.55	0.55	0.55	37.5%	-	-	-

Please note: The reference value (15%) for the proportion of renewable primary energy is derived from the current proportion of renewable primary energy in the German energy mix in accordance with *Ökobau.dat* (German LCA dataset) 2017; The limit value (5%) is derived from a lower proportion of energy throughout the life cycle of the building and an energy source for heat with no proportion of renewable energy sources.

Table 5: Conversion table and sub-points for environmental indicators

SUB-POINTS	GWP	POCP	AP	EP	PE_{NR}	PE_{TOT}	PE_R/PE_{TOT}	ODP	WU	ADP_E
0	$GWP_B \geq 1.4 * GWP_{tot,ref}$	$POCP_B \geq 2.0 * POCP_{tot,ref}$	$AP_G \geq 1.7 * AP_{tot,ref}$	$EP_B \geq 2.0 * EP_{tot,ref}$	$PE_{nr} \geq 1.4 * PE_{nr,ref}$	$PE_{tot} \geq 1.4 * PE_{tot,ref}$	$PE_r/PE_{tot} = 5\%$	Values for ODP_B and ODP_{Bref} provided	Values for WU_B and WU_{Bref} provided	Values for ADP_B and ADP_{Bref} provided
40 (30 for PCM)	$GWP_B = GWP_{tot,ref}$	$POCP_B = POCP_{tot,ref}$	$AP_B = AP_{tot,ref}$	$EP_B = EP_{tot,ref}$	$PE_{nr} = PE_{nr,ref}$	$PE_{tot} = PE_{tot,ref}$	$PE_r/PE_{tot} = 15\%$	n/a	n/a	n/a
80 (60 for PCM)	$GWP_B < 0.70 * GWP_{tot,ref}$	$POCP_B < 0.70 * POCP_{tot,ref}$	$AP_B < 0.70 * AP_{tot,ref}$	$EP_B < 0.70 * EP_{tot,ref}$	$PE_{nr} < 0.70 * PE_{nr,ref}$	$PE_{tot} < 0.70 * PE_{tot,ref}$	$PE_r/PE_{tot} < 30\%$	n/a	n/a	n/a
90 (70 for PCM) (over-fulfil-ment)	$GWP_B < 0.55 * GWP_{tot,ref}$	$POCP_B < 0.55 * POCP_{tot,ref}$	$AP_B < 0.55 * AP_{tot,ref}$	$EP_B < 0.55 * EP_{tot,ref}$	$PE_{nr} < 0.55 * PE_{nr,ref}$	$PE_{tot} < 0.55 * PE_{tot,ref}$	$PE_r/PE_{tot} < 37.5\%$	n/a	n/a	n/a

Weighting of the indicators for assessing the weighted environmental impacts

Table 6: Weighting key for the environmental indicators (W)

W_{GWP}	W_{POCP}	W_{AP}	W_{EP}	$W_{PE^{NR}}$	$W_{PE^{TOT}}$	$W_{PE^{NR}/PE^{TOT}}$
40%	10%	10%	10%	15%	10%	5%

To calculate the weighted environmental impacts (= points) for indicator 3 "Life cycle assessment comparison calculation", the sub-points regarding target, reference and limit values from Table 4 and Table 5 must be assessed separately for each environmental indicator. The sub-points (SP) must then be weighted using the weighting key from Table 6. The total of the weighted sub-points is the total of the possible points in the indicator. Depending on the LCA calculation method. the target value (Y) amounts to 80 (60) points in the indicator, and an overfulfilment of the target value (Y+) can be awarded up to 100 (80) points. Fulfilment of the reference value amounts to 40 (30) points.

Points for indicator 3 =
$$SP_{GWP}*W_{GWP} + SP_{POCP}*W_{POCP} + SP_{AP}*W_{AP} + SP_{EP}*W_{EP} + SP_{PEnr}*W_{PEnr} + SP_{PEtot}*W_{PEtot} + SP_{PEnr/PEtot}*W_{PEnr/PEtot}$$

Other definitions: Life cycle assessment indicators

(1) Global warming potential (GWP)
The accumulation of greenhouse gases in the atmosphere results in warming of air layers close to the ground (greenhouse effect). The global warming potential of a substance is always indicated in comparison to the global warming potential of carbon dioxide (CO_2), meaning that emissions that contribute to the greenhouse effect are expressed as carbon dioxide (CO_2) equivalents. As greenhouse gases persist in the atmosphere for different lengths of time, the GWP value must be specified in relation to a period of time. A period of 100 years is used as a basis for characterising contributions to the GWP. In addition, impact factors are used to describe the extent to which different substances contribute to the global warming potential. Considered over a period of 100 years, a given mass of methane has an impact factor 25 times greater in comparison to an equal mass of CO_2. This means that the CO_2 equivalent of methane is 25. This means that a given mass of methane contributes 25 times as much to the greenhouse effect as an equal mass of CO_2 (with a GWP value of 1).

(2) Ozone depletion potential (ODP)
Ozone is only present in the atmosphere in low concentrations, but is extremely important for life on Earth. It can absorb short-wave UV radiation and then emit it again with a greater wavelength, regardless of direction. The ozone layer shields the Earth from a large part of the UV-A and UV-B radiation from the sun, preventing excessive warming of the Earth's surface and protecting flora and fauna. The accumulation of harmful halogenated hydrocarbons in the atmosphere contributes to the destruction of the ozone layer. The consequences of this include tumours in humans and animals and disruption of photosynthesis. The ozone depletion potential is specified in [kg R11 equivalent/m^2_{NFAs}*a]; the ODP values refer to the chlorofluorocarbon comparison substance CFC-11. All substances with a value of less than 1 have a lower ozone depletion effect while substances with a value of greater than 1 have a higher ozone depletion effect, in comparison to CFC-11 (also referred to as R11; chemical formula CCl_3F).

(3) Photochemical ozone creation potential (POCP)
The photochemical ozone creation potential indicates the equivalent amount of harmful trace gases in relation to the mass. These trace gases, such as nitrogen oxides and hydrocarbons, contribute to the formation of ground-level ozone in conjunction with UV radiation. This contamination of the ground-level air layers with a high concentration of ozone is also known as summer smog. Summer smog attacks the respiratory organs and harms plants and animals.

The concentration of ground-level ozone is regularly determined by air quality measuring stations and recorded in pollution maps.

(4) Acidification potential (AP)

The acidification potential indicates the impact of acidifying emissions; it is measured in sulphur dioxide (SO_2) equivalents. Air pollutants such as sulphur compounds and nitrogen compounds react with water in the air to form sulphuric or nitric acid; this falls to earth as "acid rain" and enters the soil and bodies of water. This harms living creatures and buildings. For instance, nutrients in acidified soil are rapidly chemically broken down and washed out more quickly. Poisonous substances can also form in the soil, attacking root systems and disrupting the water balance of plants. Taken together, the wide range of individual impacts of acidification result in two serious consequences: Forest dieback and fish mortality. However, acid rain also attacks buildings. Sandstone used in historical buildings is particularly susceptible to this.

(5) Eutrophication potential (EP)

Eutrophication refers to waters and soils changing from a low-nutrient (oligotrophic) state to a high-nutrient (eutrophic) state. This is caused by the influx of nutrients, particularly phosphorous and nitrogen compounds. These compounds can enter the environment via the manufacturing of construction products and the leaching of combustion emissions. If the concentration of available nutrients in bodies of water increases, algae growth also increases. This can lead to fish mortality, among other consequences.

(6) Non-renewable primary energy demand (PEnr)

The demand for non-renewable primary energy is determined for construction, repair, operation and dismantling/disposal of the building over its life cycle.
The demand for non-renewable primary energy is determined in relation to area and year and specified in [MJ/m^2_{NFAs}*a]. The values required for calculation can (as in criterion ENV1.1 "Life cycle impact assessment") be determined from the energy performance certificate (EPC). The environmental impacts of the construction and the technical facilities can be derived from the life cycle assessment for the materials used.

(7) Total primary energy demand (PEtot)

The required calculation values for the use phase are obtained from the energy certificate. The life cycle assessments for the materials and components used are consulted in order to determine the environmental impacts of construction and technical facilities. Reference values for an average building help with assessment of the construction and technical facilities.

(8) Proportion of renewable primary energy

This indicator assesses the proportion of the total primary energy demand covered by renewable energy. To do so, the average proportion of the total primary energy demand for the building in question covered by renewable primary energy is compared to the values of a reference building in accordance with EPC. If the value for the building is more than 30% below the reference value in accordance with EPC, the requirement for the proportion of renewable primary energy can be reduced proportionally. This enables designers to achieve the overarching objective – an overall reduction in the demand for primary energy – using a variety of different concepts.

(9) Abiotic resource consumption (ADP elements)

ADP (abiotic depletion potential), as an impact category, accounts for the consumption and scarcity of non-renewable (abiotic) resources. These are mineral resources, as opposed to resources from the biosphere. Mineral resources include fossil raw materials, designated as "ADP fossil fuels", and other minerals, designated as "ADP elements". It is important to note that uranium, as a non-fossil fuel, is assigned to the "ADP elements" group. The characterisation factors for fossil raw materials represent the lower calorific value of each raw material. It is assumed that these raw

materials share the same level of scarcity, as they are interchangeable.
The characterisation factors for the remaining mineral resources take the available quantity of the resource in question and its annual extraction rate into account. The estimation of the quantity depends on how much of the raw material can be found in the Earth's crust, or how much can be provided in a technologically and economically practical manner. A variety of calculation approaches are used for this: The "ultimate reserve" only takes into account the total amount found in the Earth's crust. The "reserve base" takes into account the amount available in a technologically and economically practical manner, while the "economic reserve" takes into account the amount that is economically viable to extract. DIN EN 15804 and DIN EN 15978 incorporate the "ultimate reserve" approach.

(10) Water use (WU)
Water consumption or water use refers to any extraction caused by humans, whether temporary or permanent, from a water catchment area, where the extracted water is not deposited back into the same water catchment area. Water consumption can include evaporation, transpiration, inclusion in products/materials or deposition into a different water catchment area or into the sea. Evaporation from a water reservoir can also be counted as consumption, as can irrigation water that evaporates, if the water does not remain in the same water catchment area.
The term used was chosen with the intention that water that is merely used but remains in the same catchment area, such as for water turbines for electricity generation, waterways for shipping, or cooling water, is not counted as consumption. Rainwater that evaporates as a result of natural processes is likewise not counted as consumption.
The standards EN 15978 and EN 15804, which are relevant to the DGNB criteria, contain the indicator "net use of fresh water".
When the EN standards were adopted, ISO 14046 "Environmental 100 management — Water footprint — Principles, requirements and guidelines" had not yet been sufficiently discussed. It was only completed in May 2014. The intention was to use the terms from ISO 14046. The guidance document (which is currently under development) for implementation of EN 15804 describes the indicator in more detail, taking ISO 14046 into account. The standards EN 15978 and EN 15804 generally differentiate between consumption/depletion and use. However, "net use of fresh water" refers to the use of fresh water in the sense of consumption, which the term "net use" is intended to convey.
In the life cycle assessment software systems, e.g. GaBi ts, this indicator is in some cases designated as "Blue water consumption" and specified in [kg].

IV. Usage-specific description

Consumer markets

Shopping centre

Department stores

The reference values must be determined in accordance with the "General description of the evaluation method".
The reference values must be determined in accordance with the "General description of the method". For the reference building in accordance with EPC, the following maintained illuminance values should be included in the calculations:

- Low illuminance: 500 lux, corresponding to approx. 13 W/m² (*)
  (Retail sectors: General, foodstuffs, bakery, furniture, household goods, etc.)
- Medium illuminance: 750 lux, corresponding to approx. 20 W/m² (*)
  (Retail sectors: Mall, textiles, cleaning, perfumery, leather goods, etc.)
- High illuminance: 1000 lux, corresponding to approx. 26 W/m² (*)
  (Retail sectors: Jewellery, lighting, radio and television, etc.)
- Very high illuminance: 1500 lux, corresponding to approx. 39 W/m² (*)
  (Tenant fit out)

(*) "Compact fluorescent lamps with external electronic ballast" are used as a basis (directly) as an average value from high-efficiency T5/T8 lighting and less efficient spotlights.

The reference specifications for electricity consumption for refrigeration facilities for users can be found in Appendix 3 and onwards.

Assembly buildings

Assembly buildings, according to the building volume, to be assigned to one of the following building types:

- Type I: Buildings predominantly without “hall character” (e.g. congress centres, libraries)
- Type II: Buildings largely with “hall character” (such as exhibition halls, town halls)

Appendix 1: System boundaries for the life cycle assessment in the DGNB system

Legend:

x = taken into account
(x) = partly taken into account
= not taken into account
= not relevant

	A 1–3 PRODUCTION PHASE			A 4–5 ERECTION PHASE		B 1–7 USE PHASE							C 1–4 END OF THE LIFE CYCLE				D BENEFITS AND LIABILITIES OUTSIDE OF THE SYSTEM LIMITS
	RAW MATERIALS PROCUREMENT	TRANSPORT	PRODUCTION	TRANSPORT	EREC-TION/INSTALLATION	USE	MAINTENANCE	REPAIR	REPLACEMENT	MODERNISATION	ENERGY CONSUMPTION DURING OPERA-	WATER CONSUMPTION DURING OPERATION	DISMANTLING/DEMOLITION	TRANSPORT	WASTE RECYCLING	DISPOSAL	POTENTIAL FOR RE-USE, RECOVERY AND RECYCLING
System Boundaries included in the LCA of the construction	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Structural components and construction works																	
Excavation																	
Excavation work																	
Support work																	

Dewatering											
Excavation, other items											
Foundations											
Soil improvement	x	x	x							x	x	x
Shallow foundations	x	x	x							x	x	x
Deep foundations	x	x	x							x	x	x
Subfloors and base slabs	x	x	x				(x)[1]			x	x	x
Floorings	x	x	x			(x)[2]	(x)[1]			x	x	x
Waterproofing of structure	x[6]	x[6]	x[6]				(x)[1]			x[6]	x[6]	x[6]
Drainage	x	x	x				(x)[1]			x	x	x
Foundations, other items	x[7]	x[7]	x[7]				(x)[1]			x[7]	x[7]	x[7]
External walls												
Load-bearing external walls	x	x	x				(x)[1]			x	x	x
Non-load-bearing external walls	x[7]	x[7]	x[7]				(x)[1]			x[7]	x[7]	x[7]
External columns	x	x	x				(x)[1]			x	x	x
External doors and windows	x[6]	x[6]	x[6]			(x)[2]	(x)[1]			x[6]	x[6]	x[6]
Cladding units	x[6]	x[6]	x[6]			(x)[2]	(x)[1]			x[6]	x[6]	x[6]
Internal linings (of external walls)	x[6]	x[6]	x[6]			(x)[2]	(x)[1]			x[6]	x[6]	x[6]
Prefabricated façade units	x[7]	x[7]	x[7]				(x)[1]			x[7]	x[7]	x[7]
Solar protection	x[6]	x[6]	x[6]				(x)[1]			x[6]	x[6]	x[6]
External walls, other items	x[7]	x[7]	x[7]				(x)[1]			x[7]	x[7]	x[7]
Internal walls												
Load-bearing internal walls	x	x	x				(x)[1]			x	x	x

Non-load-bearing internal walls	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Internal columns	x	x	x			(x)[1]		x	x	x
Internal doors and windows	x[6]	x[6]	x[6]		(x)[2]	(x)[1]		x[6]	x[6]	x[6]
Internal linings (of internal walls)	x[6]	x[6]	x[6]		(x)[2]	(x)[1]		x[6]	x[6]	x[6]
Prefabricated wall units	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Internal walls, other items	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Floors and ceilings										
Floor structures	x	x	x			(x)[1]		x	x	x
Floorings	x[7]	x[7]	x[7]		(x)[2]	(x)[1]		x[7]	x[7]	x[7]
Ceiling linings	x[7]	x[7]	x[7]		(x)[2]	(x)[1]		x[7]	x[7]	x[7]
Floors and ceilings, other items	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Roofs										
Roof structures	x	x	x			(x)[1]		x	x	x
Roof lights, roof openings	x[6]	x[6]	x[6]		(x)[2]	(x)[1]		x[6]	x[6]	x[6]
Roofing	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Roof coverings	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Roofs, other items	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Structural construction installations										
General installations	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Special installations	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]
Structural construction installations, other	x[7]	x[7]	x[7]			(x)[1]		x[7]	x[7]	x[7]

Other construction-related activities											
Site equipment											
Scaffolding											
Safety measures											
Demolition work											
Repair work											
Final disposal of materials											
Additional work											
Temporary construction work											
Other construction-related activities, other items											
Technical building components											
Sewerage, water and gas systems											
Sewerage systems	x[6]	x[6]	x[6]			(x)[1]		(x)[3]	x[6]	x[6]	x[6]
Water supply systems	x[6]	x[6]	x[6]			(x)[1]		(x)[3]	x[6]	x[6]	x[6]
Gas supply systems	x[6]	x[6]	x[6]			(x)[1]	x		x[6]	x[6]	x[6]
Sewerage, water and gas systems, other items	x[6]	x[6]	x[6]			(x)[1]			x[6]	x[6]	x[6]
Heat supply systems	x[6]	x[6]	x[6]						x[6]	x[6]	x[6]
Heat generators	x[6]	x[6]	x[6]			(x)[1]	x		x[6]	x[6]	x[6]
Heat distribution networks	x[6]	x[6]	x[6]			(x)[1]	x		x[6]	x[6]	x[6]
Space heating	x[6]	x[6]	x[6]			(x)[1]			x[6]	x[6]	x[6]
Heat supply systems, other items	x[6]	x[6]	x[6]			(x)[1]			x[6]	x[6]	x[6]

Air treatment systems	x[6]	x[6]	x[6]				x[6]	x[6]	x[6]
Ventilation systems	x[6]	x[6]	x[6]		(x)[1]	x	x[6]	x[6]	x[6]
Partial air conditioning systems	x[6]	x[6]	x[6]		(x)[1]	x	x[6]	x[6]	x[6]
Air conditioning systems	x[6]	x[6]	x[6]		(x)[1]	x	x[6]	x[6]	x[6]
Refrigerating plants	x[6]	x[6]	x[6]		(x)[1]	x	x[6]	x[6]	x[6]
Air treatment systems, other items	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]
Power installations	x[6]	x[6]	x[6]				x[6]	x[6]	x[6]
High and medium voltage plants	x[6]	x[6]	x[6]		(x)[1]	x	x[6]	x[6]	x[6]
Independent power supply installations	x[6]	x[6]	x[6]		(x)[1]	x	x[6]	x[6]	x[6]
Low-voltage switchgears	x[6]	x[6]	x[6]		(x)[1]	x	x[6]	x[6]	x[6]
Low voltage installation equipment	x[6]	x[6]	x[6]		(x)[1]	(x)[5]	x[6]	x[6]	x[6]
Lighting systems	x[6]	x[6]	x[6]		(x)[1]	x	x[6]	x[6]	x[6]
Lightning protection and earthing systems	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]
Power installations, other items	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]
Telecommunications and other communications systems	x[6]	x[6]	x[6]				x[6]	x[6]	x[6]
Telecommunications systems	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]
Search and signalling equipment	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]
Time metering systems	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]
Electroacoustic equipment	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]
Television and aerial systems	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]
Security systems	x[6]	x[6]	x[6]		(x)[1]		x[6]	x[6]	x[6]

Transmission networks	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Telecommunications and other communications systems, other items	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Transport systems	x[6]	x[6]	x[6]			x[6]	x[6]	x[6]
Lifts	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Escalators, moving pavements	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Inspection and maintenance conveyors	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Conveying plants	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Cranes	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Transport systems, other items	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Function-related equipment and fitments	x[6]	x[6]	x[6]			x[6]	x[6]	x[6]
Kitchen fitments	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Laundry and dry cleaning equipment	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Media supply systems	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Medical and laboratory equipment	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Fire-fighting installations	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Swimming baths equipment	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Process heat plants, refrigeration plants, process air plants	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Disposal facilities	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]
Function-related equipment and fitments, other items	x[6]	x[6]	x[6]		(x)[1]	x[6]	x[6]	x[6]

Building automation	x[6]	x[6]	x[6]					x[6]	x[6]	x[6]
Automated systems	x[6]	x[6]	x[6]			(x)[1]	(x)[5]	x[6]	x[6]	x[6]
Control cabinets	x[6]	x[6]	x[6]			(x)[1]	(x)[5]	x[6]	x[6]	x[6]
Management and operator facilities	x[6]	x[6]	x[6]			(x)[1]	(x)[5]	x[6]	x[6]	x[6]
Room control systems	x[6]	x[6]	x[6]			(x)[1]	(x)[5]	x[6]	x[6]	x[6]
Transmission networks	x[6]	x[6]	x[6]			(x)[1]	(x)[5]	x[6]	x[6]	x[6]
Building automation, other items	x[6]	x[6]	x[6]			(x)[1]	(x)[5]	x[6]	x[6]	x[6]
Other services-related work										
Site equipment										
Scaffolding										
Safety measures										
Demolition work										
Repair work										
Final disposal of materials										
Additional work										
Temporary construction work										
Other services-related work, other items										

1) Only includes the production and disposal of the replaced product, not the replacement process itself (same as for construction process).
2) Maintenance processes are partially represented as water consumption in ENV1.1.
3) Water consumption of the building is represented in ENV1.1.
4) Photovoltaic systems are not represented due to insufficient data.
5) User electricity consumption is not recorded in full, as it is not completely determined in DIN V 18599.
6) Not included in the partial calculation method (PCM) of the building components
7) Only concrete, incl. reinforcement (and when applicable, perimeter insulation) to be considered in case of PCM

System boundaries for the life cycle assessment in the DGNB system

(Use phase detailed)

Legend:

x = taken into account
(x) = partly taken into account
= not taken into account
= not relevant

	A 1–3 PRODUCTION PHASE			A 4–5 ERECTION PHASE		B 1–7 USE PHASE								C 1–4 END OF THE LIFE CYCLE				D BENEFITS AND LIABILITIES OUTSIDE OF THE SYSTEM LIMITS
	RAW MATERIALS PROCUREMENT	TRANSPORT	PRODUCTION	TRANSPORT	ERECTION/INSTALLATION	USE	MAINTENANCE	REPAIR	REPLACEMENT	MODERNISATION	ENERGY CONSUMPTION DURING OPERATION	WATER CONSUMPTION DURING OPERATION		DISMANTLING/DEMOLITION	TRANSPORT	WASTE RECYCLING	DISPOSAL	POTENTIAL FOR REUSE, RECOVERY AND RECYCLING
System boundaries in the usage phase	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7		C1	C2	C3	C4	D
Operating costs																		
Supply																		
Water											x							
Oil											x							

Gas							x			
Solid fuels							x			
Urban district heating							x			
Electricity							x			
Technical media										
Supply, other items										
Repair costs										
Structural repairs										
Foundations			(x)[1]	(x)[3]		(x)[2]				
External walls			(x)[1]	(x)[3]		(x)[2]				
Internal walls			(x)[1]	(x)[3]		(x)[2]				
Floors and ceilings			(x)[1]	(x)[3]		(x)[2]				
Roofs			(x)[1]	(x)[3]		(x)[2]				
Structural fitments			(x)[1]			(x)[2]				
Structural repairs, other items			(x)[1]			(x)[2]				

Repair of installations[4]						
Sewerage, water and gas systems			(x)[2)]	x		
Heat supply systems			(x)[2)]	x		
Air treatment systems			(x)[2)]	x		
Power installations			(x)[2)]	x		
Telecommunications and other communications systems			(x)[2)]			
Transport systems			(x)[2)]			
Function-related equipment and fitments			(x)[2)]	x		
Building automation			(x)[2)]			
Repair of installations, other items			(x)[2)]			
Repair of external works						
Ground surfaces						
Hard surfaces						
External construction works						
External services						
External fitments						
Repair of external works, other items						
Repair of equipment						
Equipment						

Works of art Repair of equipment, other items							

1) Taken into account by other criteria such as indoor air quality. Not included in ENV1.1.

2) Only includes the production and disposal of the replaced product, not the replacement process itself (same as for construction process).

3) Maintenance processes are partially represented as water consumption in ENV1.1.

4) not included in the PCM

Appendix 2

Building energy demand during operation (Module B6)

As an alternative to the default standard DIN V 18599 (German standard for calculation of the net, final and primary energy demand for heating, cooling, ventilation, domestic hot water and lighting), the final energy demand can be determined via country specific building EPC or building dynamic energy performance simulation. DGNB refers to the several calculation and simulation standards to specify a general framework for the assessment of overall energy use of a building and the calculation of energy performance assessments in terms of primary energy or other energy related metrics. The following boundary conditions for EPC calculation and building energy performance simulation standards have to be considered when doing so. Table 7 below shows the graphical demonstration of optional pathways towards a building energy demand calculation (option 1) and simulation (option 2).

Table 7: options for energy simulation or calculation

Option 1		Option 2	
National Energy Performance Certificate (EPC)		**Building dynamic energy performance simulation****	
a	b	a	b
DIN 18599*	**The local Standard**	**EN ISO 52000**	**ASHRAE 90.1**
Detailed description in Appendix 2.2		Detailed description in Appendix 2.1	

*instead of the DIN 18599 standard other compatible calculation methods are allowed to be used, e.g. PHPP – Passive House Planning Package.
**PHPP – Passive House Planning Package is ASHRAE 140 conform, thus it can be used as a substitute for various simulation programs. PHPP offers a sophisticated Excel based tool for the building energy demand calculation together with the large worldwide climate data:
https://passipedia.org/planning/calculating_energy_efficiency/phpp_-_the_passive_house_planning_package

Appendix 2.1: Basic principles and relevant standards for the dynamic building simulation

For simulation purposes, DGNB refers to the overarching energy efficiency of buildings (EPB), EN ISO 52000: 2017 family standards (for details see also the following table 8 under the boundary conditions and Appendix 4 for the default choices) that offers choices to tailor the assessment to any national situation, worldwide. In general, the holistic approach must be used in order to calculate the energy demand of the building. Holistic approach means that the energy performance is assessed as the total energy used for heating, cooling, lighting, ventilation, domestic hot water and in some cases, appliances. It ensures that all technologies are treated equally and balanced. Simulation standards have to contain specifications for the assessment of thermal zones in the building or in the part of a building. The calculations are performed per thermal zone. In the calculations, the thermal zones can be assumed to be thermally coupled or not. As an alternative to the EN ISO 52000 family standards, ASHRAE Energy Standard 90.1-2013 (or latest) can be applied. The simulation program shall be tested according to ASHRAE 140: 2011 (or latest) Standard. Assessment have to be performed using the microclimate of the building site location (e.g. "urban heat island" for inner city locations), using typical meteorological climate data in hourly values for the location (test reference year), adopted to the local climate known from the past 30 years.

Boundary conditions
The overarching EPB standard EN ISO 52000 has a modular structure (described in EN ISO 52000-1: 2017) which contains the following four main areas:

- M1 Overarching standards
- M2 Building (as such)
- M3 - M11 Technical Building Systems under EPB
- M12 - M13 Other systems or appliances (non-EPB)

Table 8: modular structure of the EN ISO 52000-1

Overarching		Building (such as)		Technical Building Systems										
	Descriptions		Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation & Control	Electricity production
Sub1	**M1**	Sub1	**M2**	Sub1	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**

Table 8 shows the relative position of this document within the set of EPB standards in the context of the modular structure as set out in EN ISO 52000-1.
Note 1. In ISO/TR 52000-2 the same table can be found, with, for each module, the numbers of the relevant EPB standards and accompanying technical reports that are published or in preparation.
Note 2. The modules represent EPB standards, although one EPB standard could cover more than one module and one module could be covered by more than one EPB standard, for instance, a simplified and a detailed method respectively

Modules **M3** to **M11** together with the overarching descriptions from **M1** and **M2**, have to be considered as the boundary conditions which have to be taken into a consideration for the comprehensive and holistic building energy performance simulation, using dynamic weather data from the local (national) Meteorological Office. More information regarding the validation of calculation procedures given in the standard are provided in the Technical Report accompanying overarching main document ISO/TR 52000-2. Appendix 4 provides information about the default standards, informative default choices and references to other EPB standards.

Calculation boundary
The calculation boundary for operating conditions data for measured energy performance are determined according to modules:

- M3-10 for heating;
- M4-10 for domestic hot water;
- M4-10 for cooling;
- M5-10 for ventilation;
- M9-10 for lighting;
- M10-10 for building automation and control;
- M11-10 for electricity production.

Considering overarching definitions and regulations from EN ISO 52000-1: 2017 (e.g. Measurement intervals and measurement period, Zoning, etc.). The simulation program shall be capable of performing design load calculations to determine required HVAC equipment capacities and air and water flow rates in accordance with generally accepted engineering standards (e.g. standards listed in Appendix 4) and handbooks (e.g. ASHRAE Handbook-Fundamentals)

for both, the proposed design and baseline building design.

Appendix 2.2: country specific EPC

In general, building energy performance simulation is necessary when no national regulation is available. In case the local standard is used in context of national or regional legal requirements, it can be accepted from DGNB as a valid document for building energy performance calculation. In any case the national/regional standard must be communicated with the DGNB office for eventual validation. Even if it is expected, that national/regional standards are not corresponding fully with the default values, choices and references of EPB standards (EN ISO 52000 standard family) listed in Appendix 4 or ASHRAE 90.1 followed due to national regulations, policy or traditions, etc. the following boundary conditions must be taken in account:

- The holistic approach must be used in order to calculate the energy demand of the building
- The calculations are performed per thermal zone
- Assessment have to be performed using the microclimate of the building site location
- Energy performance calculation must be based at least on monthly calculations

Calculation boundary

To verify the country specific national/regional EPC of the building, the following set of services must be considered while calculating the overall building energy performance:

a) The (sensible) energy need for heating and cooling;
b) The latent energy need for (de-)humidification;
c) The energy need for lighting (incl. lighting controls)
d) The energy need of ventilation and air conditioning systems
e) The energy need for domestic hot water
f) The energy need for building automation and control[9]
g) Auxiliary energy requirement
h) Energy production - renewable energy sources (on site)

The calculation methods can be used for residential or non-residential buildings, or a part of it, referred to as "the building" or the "assessed object".
However, if the iterative calculation method is essentially replaced by a thermal building simulation (mentioned above) using dynamic weather data, this will mean that the same calculation methodology will be used for evaluation of criterion "ENV 1.1 – Life cycle assessment" as for criterion "SOC 1.1 – Thermal comfort". With regard to the electricity demand, the calculation is also linked to criterion "SOC 1.4 – Visual comfort".

Reference building implementation

In general the whole LCA calculation is based on the comparative performance of the baseline (reference) building, which complies with local building regulations, and the actual (designed) building. The actual building performance and baseline building performance must be calculated using the following:

- the same simulation program
- the same weather data
- the same geometrical and area properties
- the same occupancy and use profile

there are two design options (the default values) for the reference building:

- Baseline building design characteristics in accordance with the national regulation[10]

[9] If considered by the national standard.

[10] National standard for reference building to be communicated with DGNB during adaptation process.

- Baseline building design characteristics in accordance with the Appendix 5 or characteristics specified in Section G3 of the ASHRAE 90.1 – 2013 (or latest) standard.

Simulation environment

The program used for creating the verification documentation and a summary of the key information entered into the simulation for the actual building and the reference building must be included in the documentation for the thermal building simulation.

Appendix 3

Appendix 3.1: User profile for food department with refrigerated products and commercial refrigeration

Table 9: User profile for food department with refrigerated products and commercial refrigeration

Use periods		**From**	**To**	
Daily use period	Time	08:00	20:00	Basis: Profile no. 7
Annual days of use $d_{use,a}$	d/a	300		
Annual hours of use during the day t_{day}	h/a	2999		
Annual hours of use during the night t_{night}	h/a	601		
Daily operating period for indoor air ventilation (HVAC) and cooling systems	Time	06:00	20:00	
Annual days of operation for indoor air ventilation (HVAC), cooling and heating systems respectively $d_{op,a}$	d/a	300		
Daily operating period for heating systems	Time	06:00	20:00	
Room conditions (if conditioning is available)				
Room target temperature for heating	°C	21		
Room target temperature for cooling	°C	24		
Minimum temperature for heating design	°C	20		
Maximum temperature for cooling design	°C	26		
Temperature decrease with reduced operation	K	4		
Requirements for humidity		with tolerance		
Minimum outside air flow V_E				
By number of persons	m³ / h * persons	20		
By area	m³ / h * m²			
Mechanical fresh air flow rate (in practice)		**From**	**To**	
Air exchange rate h^{-1}				
Air exchange rate, air only h^{-1}				
Lighting				
Maintained illuminance value E_m	lx	500	Low illuminance (foodstuffs), note: A value of 500 lx is averaged across the usable space, and corresponds to approx.	
Height of the working plane h_{wp}	m	0.8		
Reduction factor k_A		0.93		
Relative absence C_A		0		
Room index k		2.5		
Reduction factor for the building operating period F_1		1		

			1000 lx in the shelves	
Occupancy		**Low**	**Medium**	**High**
Maximum occupancy rate	m³ / person	6	5	4
Internal heat sources	**Hours in full use (h/d)**	**Max. specific output (W/m²)**		
		Low	Medium	High
Persons (70 W per person)	6	12	14	18
Work aids [a]	17	-12	-10	-8
Heat supply per day ($q_{l,p}+q_{l,fac}$)	Wh/(m².d)	-132	-86	-28

[a] Refrigerated cabinets are heat sinks if the thermal load is dissipated outside of the room (e.g. central commercial cooling system); otherwise, the standard value for the specific output of 5 W/m² applies (instead of -10 W/m²). Refrigerated cabinets have a lower full operating period at the weekend, which is taken into account with 300 days of use, each with full operating periods of 17 h/d.

Appendix 3.2: User profile for food department with refrigerated products without commercial refrigeration

Table 10: User profile for food department with refrigerated products without commercial refrigeration

Use periods		**From**	**To**	
Daily use period	Time	08:00	20:00	Basis: Profile no. 7
Annual days of use $d_{use,a}$	d/a	300		
Annual hours of use during the day t_{day}	h/a	2999		
Annual hours of use during the night t_{night}	h/a	601		
Daily operating period for indoor air ventilation (HVAC) and cooling systems	Time	06:00	20:00	
Annual days of operation for indoor air ventilation (HVAC), cooling and heating systems respectively $d_{op,a}$	d/a	300		
Daily operating period for heating systems	Time	06:00	20:00	
Room conditions (if conditioning is available)				
Room target temperature for heating	°C	21		
Room target temperature for cooling	°C	24		
Minimum temperature for heating design	°C	20		
Maximum temperature for cooling design	°C	26		
Temperature decrease with reduced operation	K	4		
Requirements for humidity		with tolerance		
Minimum outside air flow V_E				
By number of persons	m³ / h * persons	20		
By area	m³ / h * m²			
Mechanical fresh air flow rate (in practice)		**From**	**To**	
Air exchange rate h^{-1}				
Air exchange rate, air only h^{-1}				
Lighting				
Maintained illuminance value E_m	lx	500	Low illuminance (foodstuffs), note: A value of 500 lx is averaged across the usable space, and corresponds to approx. 1000 lx in the shelves	
Height of the working plane h_{wp}	m	0.8		
Reduction factor k_A		0.93		
Relative absence C_A		0		
Room index k		2.5		
Reduction factor for the building operating period F_1		1		
Occupancy		**Low**	**Medium**	**High**
Maximum occupancy rate	m³ / person	6	5	4
Internal heat sources	**Hours in full use (h/d)**	**Max. specific output (W/m²)**		
		Low	Medium	High
Persons (70 W per person)	6	12	14	18
Work aids [a]	17	-12	5	-8

Heat supply per day ($q_{l,p}+q_{l,fac}$)	Wh/(m².d)	-132	169	-28

[a] Refrigerated cabinets are heat sinks if the thermal load is dissipated outside of the room (e.g. central commercial cooling system); otherwise, the standard value for the specific output of 5 W/m² applies (instead of -10 W/m²). Refrigerated cabinets have a lower full operating period at the weekend, which is taken into account with 300 days of use, each with full operating periods of 17 h/d.

Appendix 3.3: 500 lux user profile

Table 11: 500 lux user profile

Use periods		**From**	**To**	
Daily use period	Time	08:00	20:00	Basis: Profile no. 6
Annual days of use $d_{use,a}$	d/a	300		
Annual hours of use during the day t_{day}	h/a	2999		
Annual hours of use during the night t_{night}	h/a	601		
Daily operating period for indoor air ventilation (HVAC) and cooling systems	Time	06:00	20:00	
Annual days of operation for indoor air ventilation (HVAC), cooling and heating systems respectively $d_{op,a}$	d/a	300		
Daily operating period for heating systems	Time	06:00	20:00	
Room conditions (if conditioning is available)				
Room target temperature for heating	°C	21		
Room target temperature for cooling	°C	24		
Minimum temperature for heating design	°C	20		
Maximum temperature for cooling design	°C	26		
Temperature decrease with reduced operation	K	4		
Requirements for humidity		with tolerance		
Minimum outside air flow V_E				
By number of persons	m³ / h * persons	20		
By area	m³ / h * m²			
Mechanical fresh air flow rate (in practice)		**From**	**To**	
Air exchange rate h^{-1}				
Air exchange rate, air only h^{-1}				
Lighting				
Maintained illuminance value E_m	lx	500	Low illuminance (general, foodstuffs, bakery, furniture, household goods, etc.)	
Height of the working plane h_{wp}	m	0.8		
Reduction factor k_A		0.93		
Relative absence C_A		0		
Room index k		2.5		
Reduction factor for the building operating period F_1		1		
Occupancy		**Low**	**Medium**	**High**
Maximum occupancy rate	m³ / person	6	5	4
Internal heat sources	**Hours in full use (h/d)**	**Max. specific output (W/m²)**		
		Low	Medium	High
Persons (70 W per person)	6	12	14	18
Work aids	12	1	2	3
Heat supply per day ($q_{l,p}$+$q_{l,fac}$)	Wh/(m².d)	84	108	144

Appendix 3.4: 750 lux user profile

Table 12: 750 lux user profile

Use periods		**From**	**To**	
Daily use period	Time	08:00	20:00	Basis: Profile no. 6
Annual days of use $d_{use,a}$	d/a	300		
Annual hours of use during the day t_{day}	h/a	2999		
Annual hours of use during the night t_{night}	h/a	601		
Daily operating period for indoor air ventilation (HVAC) and cooling systems	Time	06:00	20:00	
Annual days of operation for indoor air ventilation (HVAC), cooling and heating systems respectively $d_{op,a}$	d/a	300		
Daily operating period for heating systems	Time	06:00	20:00	
Room conditions (if conditioning is available)				
Room target temperature for heating	°C	21		
Room target temperature for cooling	°C	24		
Minimum temperature for heating design	°C	20		
Maximum temperature for cooling design	°C	26		
Temperature decrease with reduced operation	K	4		
Requirements for humidity		with tolerance		
Minimum outside air flow V_E				
By number of persons	m³ / h * persons	20		
By area	m³ / h * m²			
Mechanical fresh air flow rate (in practice)		**From**	**To**	
Air exchange rate h^{-1}				
Air exchange rate, air only h^{-1}				
Lighting				
Maintained illuminance value E_m	lx	750	Medium illuminance (mall, textiles, cleaning, perfumery, leather goods, etc.)	
Height of the working plane h_{wp}	m	0.8		
Reduction factor k_A		0.93		
Relative absence C_A		0		
Room index k		2.5		
Reduction factor for the building operating period F_1		1		
Occupancy		**Low**	**Medium**	**High**
Maximum occupancy rate	m³ / person	6	5	4
Internal heat sources	**Hours in full use (h/d)**	**Max. specific output (W/m²)**		
		Low	Medium	High
Persons (70 W per person)	6	12	14	18
Work aids	12	1	2	3
Heat supply per day ($q_{l,p}$+$q_{l,fac}$)	Wh/(m².d)	84	108	144

Appendix 3.5: 1000 lux user profile

Table 13: 1000 lux user profile

Use periods		**From**	**To**	
Daily use period	Time	08:00	20:00	Basis: Profile no. 6
Annual days of use $d_{use,a}$	d/a	300		
Annual hours of use during the day t_{day}	h/a	2999		
Annual hours of use during the night t_{night}	h/a	601		
Daily operating period for indoor air ventilation (HVAC) and cooling systems	Time	06:00	20:00	
Annual days of operation for indoor air ventilation (HVAC), cooling and heating systems respectively $d_{op,a}$	d/a	300		
Daily operating period for heating systems	Time	06:00	20:00	
Room conditions (if conditioning is available)				
Room target temperature for heating	°C	21		
Room target temperature for cooling	°C	24		
Minimum temperature for heating design	°C	20		
Maximum temperature for cooling design	°C	26		
Temperature decrease with reduced operation	K	4		
Requirements for humidity		with tolerance		
Minimum outside air flow V_E				
By number of persons	m³ / h * persons	20		
By area	m³ / h * m²			
Mechanical fresh air flow rate (in practice)		**From**	**To**	
Air exchange rate h^{-1}				
Air exchange rate, air only h^{-1}				
Lighting				
Maintained illuminance value E_m	lx	1000	High illuminance (jewellery, lighting, radio and television, etc.)	
Height of the working plane h_{wp}	m	0.8		
Reduction factor k_A		0.93		
Relative absence C_A		0		
Room index k		2.5		
Reduction factor for the building operating period F_1		1		
Occupancy		**Low**	**Medium**	**High**
Maximum occupancy rate	m³ / person	6	5	4
Internal heat sources	**Hours in full use (h/d)**	**Max. specific output (W/m²)**		
		Low	Medium	High
Persons (70 W per person)	6	12	14	18
Work aids	12	1	2	3
Heat supply per day ($q_{l,p}$+$q_{l,fac}$)	Wh/(m².d)	84	108	144

Appendix 3.6: 1500 lux user profile

Table 14: 1500 lux user profile

Use periods		**From**	**To**	
Daily use period	Time	08:00	20:00	Basis: Profile no. 6
Annual days of use $d_{use,a}$	d/a	300		
Annual hours of use during the day t_{day}	h/a	2999		
Annual hours of use during the night t_{night}	h/a	601		
Daily operating period for indoor air ventilation (HVAC) and cooling systems	Time	06:00	20:00	
Annual days of operation for indoor air ventilation (HVAC), cooling and heating systems respectively $d_{op,a}$	d/a	300		
Daily operating period for heating systems	Time	06:00	20:00	
Room conditions (if conditioning is available)				
Room target temperature for heating	°C	21		
Room target temperature for cooling	°C	24		
Minimum temperature for heating design	°C	20		
Maximum temperature for cooling design	°C	26		
Temperature decrease with reduced operation	K	4		
Requirements for humidity		with tolerance		
Minimum outside air flow V_E				
By number of persons	m³ / h * persons	20		
By area	m³ / h * m²			
Mechanical fresh air flow rate (in practice)		**From**	**To**	
Air exchange rate h^{-1}				
Air exchange rate, air only h^{-1}				
Lighting				
Maintained illuminance value E_m	lx	1500	Very high illuminance (tenant fit out, shopping centre)	
Height of the working plane h_{wp}	m	0.8		
Reduction factor k_A		0.93		
Relative absence C_A		0		
Room index k		2.5		
Reduction factor for the building operating period F_1		1		
Occupancy		**Low**	**Medium**	**High**
Maximum occupancy rate	m³ / person	6	5	4
Internal heat sources	**Hours in full use (h/d)**	**Max. specific output (W/m²)**		
		Low	Medium	High
Persons (70 W per person)	6	12	14	18
Work aids	12	1	2	3
Heat supply per day ($q_{l,p}$+$q_{l,fac}$)	Wh/(m².d)	84	108	144

Appendix 3.7: Reference specifications for user electricity for refrigeration facilities

Consumer markets and shopping centres feature a very high electricity consumption for refrigeration facilities for users. As the refrigeration facilities interact directly with the indoor climate concept and energy concept of the building, they are incorporated into the life cycle assessment and into the life cycle cost assessment. The electricity consumption for refrigeration facilities for users is therefore integrated into the LCC, but the envisaged manufacturing costs and maintenance costs are not, as there is no validated data currently available for them.

Table 15: Reference specifications for user electricity for refrigerated counters

	UNIT	TOTAL
Electricity consumption per linear metre	kWh/(a * linear metre)	3000 **
Operating hours/year	h/a	8760

** in accordance with German Federal Environment Agency (*Umweltbundesamt – UBA*) report (average total of normal refrigeration+deep freezing)

Appendix 4: Reference standards

Table 16: The reference standards, identified by the module code number

Reference	Reference document	
	Number	Title
M1-4	EN ISO 52003-1	Energy performance of Buildings – Indicators, requirements and certification – Part 1: General aspects and application to the overall energy performance
	EN W16798-1 or EN 15251	Energy performance of Buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of Buildings addressing indoor air quality, thermal environment, lighting and acoustics – Module M1-6; (revision of EN 15251)
M1-13	EN ISO 52010-1	Energy performance of Buildings – Overarching Assessment Procedures. External environment conditions – Part 1: Calculation Procedures
M1-14	EN 15459-1	Economic evaluation procedure for energy systems in Buildings
M2-2	EN ISO 52016-1	Energy performance of Buildings – Building and Building Elements – Calculation of Sensible and Latent Thermal Energy Needs in a Building or Building Zone – Part 1: Calculation Procedures
M2-3	EN ISO 52017-1	Energy performance of Buildings – Building and Building Elements – Calculation of the Dynamic Thermal Balance in a Building or Building Zone – Part 1: Detailed procedures
M2-4	EN ISO 52018-1	Energy performance of Buildings – Building and building elements – Ways to Express Energy Performance and Energy Performance Requirements – Part 1: Expressions and Procedures
M2-5	EN ISO 13789	Thermal performance of Buildings – Transmission and ventilation heat transfer coefficients – Calculation method
	EN ISO 13370	Thermal performance of Buildings – Heat transfer via the ground – Calculation methods
	EN ISO 6946	Building components and building elements – Thermal resistance and thermal transmittance – Calculation method
	EN ISO 10211	Thermal bridges in building construction – Heat flows and surface temperatures – Detailed calculations

	EN ISO 14683	Thermal bridges in building construction – Linear thermal transmittance – Simplified methods and default values
	EN ISO 10077-1	Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 1: General
	EN ISO 10077-2	Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 2: Numerical method for frames
	EN ISO 12631	Thermal performance of curtain walling – Calculation of thermal transmittance
M2-9	EN ISO 13786	Thermal performance of building components – Dynamic thermal characteristics – Calculation methods
M2-8	EN ISO 52022-3	Energy performance of Buildings – Building and Building Elements – Solar and Visual Characteristics – Detailed calculation method
	EN ISO 52022-1	Energy performance of Buildings – Building and Building Elements – Solar and Visual Characteristics – Simplified calculation method
M3-1	EN 15316-1	Energy performance of Buildings — Modules M3-1, M8-1— Heating and DHW systems in Buildings – Part 1: General and Energy performance expression
M3-3	EN 12831-1	Heating systems in Buildings — Method for calculation of the design heat load
M3-5	EN 15316-2	Energy performance of Buildings, modules M3-5, M4-5 – Space emission systems (heating and cooling)
M3-6	EN 15316-3	Energy performance of Buildings, Modules M3-6, M4-6, M8-6 – Distribution systems (DHW, heating and cooling)
M3-7	EN 15316-5	Energy Performance of Buildings – Modules M3-7; M8-7 – Part 5-1: Storage systems for heating and domestic hot water
M3-8	EN 15316-4-1	Energy performance of Buildings, modules M3-8-1, M8-8-1 – Heating and DHW generation systems, combustion systems (boilers, biomass)
	EN 15316-4-2	Energy performance of Buildings – Module M3-8:1 - Heating systems

		– Part 4.2:1: Generation and control – Heat pumps systems
	EN 15316-4-3	Energy performance of Buildings, modules 3-8-3, 8-8-3, 11-8-3 – Heat generation systems, thermal solar and photovoltaic systems
	EN 15316-4-4	Energy performance of Buildings – Modules M3-8-4, M8-8-4, M11-8-4 – Heat generation systems, building integrated cogenerations systems
	EN 15316-4-5	Energy performance of Buildings, Modules M3-8-5; M4-8-5; M8-8-5; M11-8-5 – District heating and cooling
	EN 15316-4-8	Energy performance of Buildings – Heating systems and water based cooling systems in Buildings - Module M3-8-8 – Space heating generation, air heating and overhead radiant heating systems, stoves (local)
M3-10	EN 15378-3	Energy performance of Buildings – Module M3-10 and M8-10 – Heating and domestic hot water measured energy performance
M3-11	EN 15378-1	Energy performance of Buildings – Heating systems in Buildings – Inspection of heating and domestic hot water systems
M4-1	EN 16798-9	Energy performance of Buildings – Part 9: Ventilation for Buildings – Module M4- 1 – Calculation methods for energy requirements of cooling systems – General
M4-3	EN 16798-11	Energy performance of Buildings – Part 11: Module M4-3 – Calculation of the design cooling load
M4-7	EN 16798 – 15	Energy performance of Buildings — Part 15: Module M4-7 – Calculation of cooling systems – Storage – General
M4-8	EN 16798-13	Energy performance of Buildings – Part 13: Module M4-8 – Calculation of cooling systems – Generation
M4-11	EN 16798-17	Energy performance of Buildings — Part 17: Ventilation for Buildings – Module M4-11, M5-11, M6-11, M7-11 – Guidelines for inspection of ventilation and air conditioning systems;
M5-1	EN 16798-3	Energy performance of Buildings – Part 3: Ventilation for non-residential Buildings – Performance requirements for ventilation and room-conditioning systems
M5-5	EN 16798-7	Energy performance of Buildings – Module M5-5 – Ventilation for Buildings – Calculation methods for energy requirements of ventilation and air conditioning systems – Part 7: Emission (determination of

		air flow rates)
M5-6	EN 16798-5	Energy performance of Buildings – Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7- 8 – Ventilation for Buildings – Calculation methods for energy requirements of ventilation and air conditioning systems – Part 5-1: Distribution and generation– Method 1
M8-2	EN 12831-3	Domestic hot water systems heat load and characterisation of needs
M9-1	EN 15193-1	Energy performance of Buildings – Module M9 – Energy requirements for lighting – Part 1: Specifications
M10-1	EN 15232	Energy performance of Buildings – Contribution of Building Automation, Controls and Building Management
M10-11		Energy Performance of Buildings – Inspection for Building Automation and Control
M10-12		Energy Performance of Buildings – Building Management System

Appendix 5

Reference Building

This appendix provides the factors to be considered for developing the global reference building in case local values are not available.

Appendix 5.1: Use and Operation

*D = daylight sensor
*M = manual (lighting switched on/off considering user behaviour)
*P = presence / motion sensor

		USE AND OPERATION									OPERATION									
													COOLING: REQUIRED TEMPERATURE			VENTILATION		LIGHTING		
	SPACE TYPE	START OF USE	END OF USE	DAILY HOURS OF USE [HOURS/DAY]	YEARLY HOURS OF USE (MONDAY TO FRIDAY, MINUS HOLIDAY) [HOURS/A]	DAILY OPERATION HOURS HVAC	YEARLY OPERATION HOURS HVAC	MEDIUM OCCUPANCY NUMBERS [M3/P]	THERMAL DISCHARGE BY PERSON (SENSITIVE) [WH/M2 DAY]	THERMAL DISCHARGE BY EQUIPMENT AND MACHINERY [WH/M2 DAY]	HEATING : REQUIRED TEMPERATURE [°C]		[°C]	OFF-TIME [°C]	PRIMARY ENERGY [%]	MINIMUM FRESH AIR EXCHANGE RATE [M3/M2H]	MINIMUM HUMIDITY DEMAND	ILLUMINATION [LUX]	FACTOR LIGHTING	LIGHTING CONTROL
1	SINGLE / CLUSTER OFFICE	07:00	18:00	11	2750	13	3250	14	30	42	21	17	24	no demand	50	4	none	500	0.7	D*
2	OPEN SPACE OFFICE	07:00	18:00	11	2750	13	3250	10	42	60	21	17	24	no demand	50	6	none	500	1	D*
3	CONFEREN	07:00	18:00	11	2750	13	3250	3	96	8	21	17	24	no demand	-	15	none	500	1	P*

	CE, MEETING, SEMINAR																			
4	COUNTER HALL	07:00	18:00	11	2750	13	3250	12	36	24	21	17	24	no demand	-	2	none	200	1	M*
5	CANTEEN	08:00	15:00	7	1750	9	2250	1.2	177	10	21	17	24	no demand	-	18	none	200	1	M*
6	RESTAURANT	10:00	00:00	14	4200	16	4800	1.2	236	14	21	17	24	no demand	-	18	none	200	1	M*
7	KITCHEN	10:00	23:00	13	3250	15	4500	10	56	1800	21	17	24	no demand	-	90	none	500	1	M*
8	KITCHEN – PREPARATION, STORAGE	10:00	23:00	13	3250	15	4500	10	56	180	21	17	24	no demand	-	15	none	300	1	P*
9	LAVATORY, BATHROOMS	07:00	18:00	11	2750	13	3250	-	0	0	21	17	24	no demand	50	15	none	200	1	P*
10	ADJACENT AREAS (WITHOUT RECREATION AREAS)	07:00	18:00	11	2750	13	3250	-	0	0	21	17	24	no demand	50	0.15	none	100	1	P*
11	CIRCULATION SPACES	07:00	18:00	11	2750	13	3250	-	0	0	21	17	24	no demand	50	0	none	100	1	P*
12	STORAGE, SERVICE ROOM	07:00	18:00	11	2750	13	3250	-	0	0	21	17	24	no demand	50	0.15	none	100	1	M*
13	SERVER ROOM	00:00	00:00	24	8760	24	8760	30	15	1800	21	17	24	no demand	-	1.3	none	500	0.5	P*

14	PARKING GARAGE (OFFICE AND PRIVATE USE)	07:00	18:00	11	2750	13	3250	-	0	0	-	-	-	no demand	-	8	none	75	1	M*
15	PARKING GARAGE (PUBLIC USE)	09:00	00:00	15	5475	17	6205	-	0	0	-	-	-	no demand	-	16	none	75	1	M*

Appendix 5.2: Building Envelope

NO.	BUILDING ELEMENT	PROPERTIES	VALUES FOR REFERENCE BUILDING
1.1	OUTSIDE WALL, FLOOR SLAP EXPOSED TO AIR	Coefficient of heat transmission	U_W = 0.28 W/(m² K)
1.2	CURTAIN FAÇADE (SEE ALSO NO. 1.14)	Coefficient of heat transmission	U_W = 1.40 W/(m² K)
		Coefficient of thermal conductivity for glazing	g = 0.48
		Luminous transmission index of glazing	T_{D65} = 0.72
1.3	WALL EXPOSED TO SOIL, BASE PLATE, WALLS AND CEILINGS CONNECTED TO NON-HEATED ROOMS (BESIDES BUILDING ELEMENTS ACCORDING TO NO. 1.4)	Coefficient of heat transmission	U_W = 0.35 W/(m² K)
1.4	ROOF (AS FAR AS NOT CONSIDERED IN NO. 1.5), TOP FLOOR SLAP, WALLS IN DIRECTION OF NAVE AISLE	Coefficient of heat transmission	U_W = 0.20 W/(m² K)
1.5	GLASS ROOF	Coefficient of heat transmission	U_W = 2.70 W/(m² K)
		Coefficient of thermal conductivity for glazing	g = 0.63
		Luminous transmission index of glazing	T_{D65} = 0.76
1.6	LIGHTING ROW	Coefficient of heat transmission	U_W = 2.40 W/(m² K)
		Coefficient of thermal conductivity for glazing	g = 0.55
		Luminous transmission index of glazing	T_{D65} = 0.48
1.7	LIGHT CUPOLA	Coefficient of heat transmission	U_W = 2.70 W/(m² K)
		Coefficient of thermal conductivity for glazing	g = 0.64
		Luminous transmission index of glazing	T_{D65} = 0.59
1.8	WINDOWS, GLAZED DOORS (SEE ALSO NO. 1.14)	Coefficient of heat transmission	U_W = 1.30 W/(m² K)
		Coefficient of thermal conductivity for glazing	g = 0.60

		Luminous transmission index of glazing	T_{D65} = 0.78
1.9	ROOF LIGHT, SKY LIGHT (SEE ALSO NO. 1.14)	Coefficient of heat transmission	U_W = 1.40 W/(m² K)
		Coefficient of thermal conductivity for glazing	g = 0.60
		Luminous transmission index of glazing	T_{D65} = 0.78
1.10	OUTSIDE DOOR	Coefficient of heat transmission	U_W = 1.80 W/(m² K)
1.11	BUILDING ELEMENTS FROM NO. 1.1 AND 1.3 TO 1.10	Thermal bridge adjustment	ΔU_W = 0.05 W/(m² K)
1.12	LEAK TIGHTNESS OF BUILDING	Related value n_{50}	with ventilation: n_{50} = 1.0 h^{-1} without ventilation: n_{50} = 1.5 h^{-1}
1.13	DAYLIGHT SUPPLY BY SUN SHADING AND/OR GLARE SHIELD	Daylight supply factor $C_{TL,Vers,SA}$	No sun shading or glare shield provided: 0.70 Glare shield provided: 0.15

1.14	SUN SHADING DEVICE	Sun shading devices of the constructed building need to be taken into account for calculating the reference building. This refers to the insulation from heat during summer days according to criterion TEC1.3, Indicator 6 “Solar Heat Protection”.
		If solar glass is used to fulfil this Indicator, the following values need to be taken into account for the used solar glass:
		▪ Instead of NO. 1.2
		  ▪ Coefficient of thermal conductivity for glazing: g = 0.35
		  ▪ Luminous transmission index of glazing: T_{D65} = 0.58
		▪ Instead of values of NO. 1.8 and 1.9:
		  ▪ Coefficient of thermal conductivity for glazing: g = 0.35
		  ▪ Luminous transmission index of glazing: T_{D65} = 0.62	

Appendix 5.3: Heating, Ventilation, Air-Conditioning, Lighting

NO.	SYSTEM	VALUES FOR REFERENCE BUILDING
2.1	LIGTHING TECHNIQUE	Direct / Indirect, each with electronic ballast and fluorescent tube
2.2	LIGHTING CONTROL	See Table of Appendix 5.1, column “Lighting control”
3.1	HEATING (CEILING HEIGHT ≤ 4 M) – HEAT GENERATORS	Considering boiler, forced-air burner, domestic fuel oil, placed outside of the thermal envelope, water content > 0.15 l/kW
3.2	HEATING (CEILING HEIGHT ≤ 4 M) – HEAT DISTRIBUTION	▪ <u>In case of radiator heating and hot-air heating (decentralised re-heater of the ventilation system):</u> Double-pipe network, external distribution pipes in unheated areas, internal ascending pipes, internal supply lines, system-temperature 55/45 °C, hydraulic aligned, Δp constant, pump designed by its demand, pump with intermittent operation, no overflow valves, calculating the length of the reference building, 70% of the standard length as well the ambient temperature can be chosen according to DIN V 18599-5. ▪ <u>In case of central ventilation system:</u> Double-pipe network, system-temperature 70/55 °C, hydraulic aligned, Δp constant, pump designed by its demand, for calculating the reference building the lengths and position of pipes must be assumed the same as for the actual building.
3.3	HEATING (CEILING HEIGHT ≤ 4 M) – HEAT TRANSFER	▪ <u>In case of radiator heating:</u> Free heating surfaces fixed to outside walls with glass surfaces and radiation protection, P-controller (1K), no auxiliary energy. ▪ <u>In case of hot-air heating (decentralised re-heater of the ventilation system):</u> Room temperature as controlled variable, high control quality.
3.4	HEATING (CEILING HEIGHT > 4 M)	<u>Heating system:</u> Hot-air heating with standard induction outlet, air outlet sideways, P-controller (1K) according to DIN V 18599-5.
4.1	DOMESTIC HOT WATER – CENTRAL SYSTEM	▪ <u>Heat generator:</u> Solar collector according to DIN V 18599-8, Section 6.4.1, including ▪ flat-plate collector: $A_C = 0.09 \cdot (1.5 \cdot NFA_s^*)^{0.8}$

		▪ volume of beneath solar part of storage system: $V_{S,SOL} = 2 \cdot (1.5 \cdot NFA_s^*)^{0.9}$ ▪ in case of $NFA_s^* > 500\ m^2$ "large scale solar plant" Remaining demand is supplied by heat generator of heating system. Note: is the net floor area of zones supplied by central system ▪ <u>Heat storage:</u> Indirect heated storage system (upright), placed outside of the thermal envelope. ▪ Heat distribution: Including circulation, Δp constant, pump designed by its demand, for calculating the reference building the lengths and position of pipes must be assumed the same as for the actual building.
4.2	HOT WATER – DECENTRAL WATER SYSTEM	Electrical instantaneous water heater, one tap and 6 meters of pipe per unit.
5.1	HVAC SYSTEMS – EXHAUST AIR SYSTEM	Specific fan power: $P_{SFP} = 1.0\ kW/(m^3/s)$
5.2	HVAC SYSTEMS – SUPPLY AND EXHAUST AIR SYSTEM WITHOUT RE-HEAT AND COOLING FUNCTION	Specific fan power: ▪ supply-air fan: $P_{SFP} = 1.5\ kW/(m^3/s)$ ▪ exhaust-air fan: $P_{SFP} = 1.0\ kW/(m^3/s)$ Extra adjustments according to DIN EN 13799, Section 6.5.2 can only be taken into account if the following components are available: HEPA-filter, gas filter or heat recovery systems class H1 or H2. ▪ Heat recovery via heat plate exchangers (cross-counter flow) with: ▪ recovered heat coefficient: $\eta_t = 0.6$ ▪ pressure ratio: $f_P = 0.4$ ▪ air duct routing inside the building
5.3	HVAC SYSTEMS – SUPPLY AND EXHAUST AIR SYSTEM WITH CONTROLLED AIR CONDITIONING	Specific fan power: ▪ supply-air fan: $P_{SFP} = 1.5\ kW/(m^3/s)$ ▪ exhaust-air fan: $P_{SFP} = 1.0\ kW/(m^3/s)$ Extra adjustments according to DIN EN 13799, Section 6.5.2 can only be taken into account if the following components are available: HEPA-filter, gas filter, or heat recovery systems class H1 or H2. ▪ Heat recovery via heat plate exchangers (cross-counter flow) with: ▪ recovered heat coefficient: $\eta_t = 0.6$

		▪ pressure ratio: $f_P = 0.4$ ▪ supply-air temperature: 18 °C ▪ air duct routing inside the building
5.4	HVAC SYSTEMS – AIR HUMIDIFYING SYSTEM	For calculating the reference building the humidifying unit must be assumed in the same way as for the actual building.
5.5	HVAC SYSTEMS – PURE AIR CONDITIONING	In case of installation of a variable air volume system: ▪ pressure ratio: $f_P = 0.4$ ▪ air duct routing inside the building
6	ROOM COOLING	▪ <u>Cooling system:</u> ▪ Chilled water fan-coil, parapet unit ▪ Cold water temperature: 14/18 °C ▪ <u>Chilled water circuit room cooling:</u> ▪ Overflow: 10% ▪ Specific electric power of distribution: $P_{d,spec} = 30\ W_{el}/kW_{cooling}$ ▪ Hydraulic aligned, controlled pump, pump hydraulic decoupled, seasonal and night/weekend switch off
7	COOLING GENERATING SYSTEM	▪ <u>Generator:</u> Piston/scroll compressor multi-level shiftable, R134a, air cooled ▪ <u>Chilled water temperature:</u> ▪ If NFAs cooled via room cooling > 5,000 m2 system temperature for this area: 14/18 °C ▪ Otherwise: 6/12 °C ▪ <u>Chilled water circuit generator inclusive HVAC cooling:</u> ▪ Overflow: 30% ▪ Specific electric power of distribution: $P_{d,spez} = 20\ W_{el}/kW_{cooling}$ ▪ Hydraulic aligned, uncontrolled pump, pump hydraulic decoupled, seasonal and night/weekend switch off ▪ Distribution outside the conditioned zone

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators.

Indicator 1: Life cycle assessments in planning

- Confirmation by the auditor and by other specialist planners involved in the planning process that life cycle assessments were used in the planning process, via the documentation for commissioning
- Excerpts from life cycle assessment comparisons with clear reference to the building
- Short description of the methodology used and the scope of the analysis
- The various pieces of documentation must demonstrate their relationship to the work phases
- Confirmation of the participation of the planning team and of communication of the life cycle assessment results (e.g. via planning logs)

Indicator 2: Life cycle assessment optimisation

- Confirmation by the auditor that life cycle assessments were evaluated for important decisions, via the documentation for commissioning
- Verification of life cycle assessment calculation and classification of whether the calculation was performed in accordance with the full consideration or partial analysis method
- Description of the alternatives considered, including content
- Clear demonstration of the relationship between the assessments and the work phases (with data)
- Confirmation of the participation of the planning team and of communication of the life cycle assessment results (e.g. via planning logs)

Indicator 3: Life cycle assessment comparison calculation
Documentation of the calculation for construction in accordance with the simplified calculation method

- Description of the building model including origin of the primary data for site plan, urban design concept and aerial photograph
- Components or surfaces/materials (quantities and estimated durations of use); if components are grouped together, this must be clearly disclosed;
- Building areas and volumes;
- Determination of quantities for the enveloping surfaces (external walls incl. windows/façades, base slab, roof) from the national EPC calculation or simulation model and allocation to the components included in the assessment;
- Windows/window doors/post and beam façades (type and area, including proportion of the frame) and description of the main profile system on average;
- Determination of quantities for the internal walls and supports; proof of plausibility via floor plans including types of internal walls/supports;
- Internal doors: Quantity (number and area) and specification of the most important types, description of the calculation;
- Determination of quantities for the ceilings of storeys;
- Description of components as layer sequence with layer thicknesses, estimated bulk densities and allocation to the data set used;
- Description of the determination of quantities for the foundations;
- For reinforced concrete, the rebar proportion must be stated in kg/m³ or kg/m² of component. Alternatively, the reinforcing steel can be documented via a complete list for the project.

- Documentation of heating and cooling systems and air conditioning systems without pipes;
- Ignored processes/components must be documented.
- Life cycle assessment data basis used. If a country specific dataset was used, this data basis or the corresponding part of the conformity check must be disclosed (e.g. compliance with the EN15804). If product-specific EPDs were used, confirmation by the auditor regarding their use must be provided.

Documentation of the calculation for construction in accordance with the complete calculation method

- Building areas and volumes;
- All components or surfaces/materials that do not fall under the cut-off criteria (quantities and estimated durations of use);
- Mass excerpt for the structural and technical components;
- The completeness of the determination of quantities must be verifiably demonstrated and proven.
- Life cycle assessment data basis used. If a country specific dataset was used, this data basis or the corresponding part of the conformity check must be verifiably disclosed.

Documentation of the use scenario calculation method

- Electricity and heating demand (final energy) for the building under certification and for the reference building in accordance national EPC or simulation. The calculation must correspond to the implemented building and the energy certificate must be enclosed with a valid signature. Specification of the specific electrical efficiency from detailed technical plan for lighting for calculation of the artificial light demand, otherwise calculation in accordance with methods listed in Appendix 2;
- Type of the heating and cooling systems and air conditioning systems as well as energy sources;
- For long-distance district heating, the proportion of renewable energy used must be proven via a corresponding certificate (but the certificate must not only account for the primary energy factor) or statement from the supplier; if the data set for the national long-distance district heating mix from relevant verified dataset is used for simplification, this is not necessary
- Estimated durations of use for the components and surfaces;
- Description and supply values in accordance with the German Renewable Energy Sources Act (EEG) for the building energy systems;
- Proof of the origin of waste heat, and how it is provided in the case of use of waste heat.
- For project-specific calculations of life cycle assessment data, it must be demonstrated that the methodological requirements of DIN EN 15804 are complied with. In this case, two forms of proof must be provided:
- Confirmation that the calculation methodology is compliant with DIN EN 15804 (provided by a recognised expert on DIN EN 15804, recognised experts include, for instance, experts who work in verifying EPD programmes compliant with DIN EN 15804 or data providers who provide data that is verifiably compliant with DIN EN 15804).
- Confirmation that the project-specific data corresponds to the input data in the calculation by an independent internal or external third party, such as a quality manager or recognised expert.
- If tools are used for calculation of project-specific life cycle assessment data, the following proof must be provided:
- If required by the DGNB conformity check, proof must be presented that the calculation method complies with the requirements of DIN EN 15804. In the case of tools, this can be a confirmation by a recognised expert on DIN EN 15804. Recognised experts include experts who work in verifying EPD programmes recognised as compliant with DIN EN 15804, such as the Institute for Building and Environment (*Institut Bauen und Umwelt e.V. - IBU*).
- In addition, if tools are used, it must be ensured that the solution actually installed/used in the building corresponds to the calculations. This can be ensured by presenting the input values entered

into the tool and the actual technical project-specific values, including proof that the input values correspond to the achieved values ("input value A corresponds to achieved value B"). This proof must be confirmed by an independent internal or external third party (e.g. signature of a quality manager, architect or site manager on the delivery note).

Documentation of the end-of-life scenario calculation method

- Allocation of the documented components to a disposal/recycling path.

Documentation of the results of the life cycle assessment

The indicator results must be presented for the entire life cycle and per m² NFAs and year, divided into:

- Construction
- Use (electricity and heating)
- Use (maintenance)
- End-of-life (recovery/disposal)

A breakdown of the results for the construction in accordance with Appendix 1 and by the 10 structural elements with the largest contributions to the indicator results is assessed as a reasonable form of documentation. To ensure consistent summarisation, the building life cycle assessment form provided by the DGNB for the life cycle assessment must be filled out.

Project report for creating the building life cycle assessment

A project report should contain the following:

- General information:
  - Designation of the building (address, etc.);
  - Author of the building life cycle assessment (name and qualifications);
  - Calculation and evaluation method used;
  - Point in the life cycle of the building at which the life cycle assessment was created;
  - Date of creation.
- General information regarding the building and the building model:
  - Building type;
  - Structure of use;
  - Required duration of use;
  - Reference period;
  - Other information regarding the building, such as: Technical type of the building (support structure type); Year of commissioning; Verification of EPC calculation, including information regarding the final energy of the reference building;
  - Energy producers and energy sources used for supplying the building with heat, cooling and warm water;

  In addition, for scheme **Assembly buildings**:
  - Evidence of the building assignment to a type I or II;
- Specification of the limits and scenarios that apply to the evaluation:
  - For the building under evaluation, it must be declared that the calculation methodology (key assumptions and scenarios) has been applied in accordance with the requirements described above.
- Data sources:
  - The data sources, type and quality of the data used must be declared qualitatively. This applies to both the building model and the life cycle assessment data.

Verification of the results

In order to ensure verifiability, all information and options used and all decisions made must be presented in a transparent form. The verification comprises the following points:

- Completeness and proof of completeness for quantification at the building level;
- Traceability of the data used for the products;
- Conformity of the data with the requirements of DIN EN 15804;
- Consistency between the scenarios that apply at the building level and the scenarios used for the products.

The parameters and calculation specifications required for calculation can be found in the following documents:

- Calculations in accordance with national EPC or energy simulation with detailed information regarding the final energy demand of the reference building, divided into energy sources and energy production methods.
- Life cycle assessment for the physical building components of the building under certification in accordance with EN ISO 14040 and 14044, containing all life cycle phases that are to be taken into account.
- LCA Datasets from 2015 or a more recent version.
- Duration of use of components (Guideline for Sustainable Building, Federal Office for Building and Regional Planning, Ministry of Transport, Building and Housing Germany, 2001) or from the Environmental Product Declarations in accordance with DIN EN 15804).

If software tools are used, it must be ensured that the requirements listed in the criterion are implemented and that the described data basis is applied.

Indicator 4: Agenda 2030 bonus – climate protection goals

- Scenario calculation results for CO_2 equivalents of the energy demand, user and/or construction
- Demonstration of climate neutrality in accordance with the recognised standard (note: The DGNB is developing its own standard for defining a "climate-neutral building", which is expected to be published by mid-2018)
- Description of the assessment of energy-related user activities and the selected method

Indicator 6: Halogenated hydrocarbons in refrigerants

- Proof of the refrigerant used, specifying the GWP factor

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
all	General and evaluation: scheme „Assembly buildings" has been added	16.09.2021
50	Note has been added regarding the variability of the total score	16.09.2021
53	Agenda bonus 2030: requirements adaptation to the DGNB "Framework for carbon-neutral buildings and sites" and inclusion of the "Climate action Roadmap"	16.09.2021
62	Indicator 6: link and formulation corrected for the GWP factors of the refrigerants.	16.09.2021
65	Partial calculation method (PCM): formulation has been amended for more clarification	16.09.2021
all	LCA calculation methodology for indicator 3: correction of the listed modules	16.09.2021
84	Usage-specific description: definition of the "assembly buildings" Type I and II have been added	16.09.2021
122	Appendix B: list of the necessary documentation for the scheme "Assembly buildings" has been added	
99	Appendix 2: finalizing the comment regarding the PHPP Tool	
all	Instead of the letter "a" in the applicable area unit NFAa, a new letter "s" (according to the DIN update) is used - NFAs	

II. Literature

- „Framework for carbon neutral buildings and sites" – German sustainable building council, 2020: https://www.dgnb.de/en/council/publications/#iframe-3
- DIN EN ISO 14040:2009-11 Environmental management – Life cycle assessment – Principles and framework. Berlin: Beuth publisher. November 2009
- DIN EN ISO 14044:2006-10 Environmental management – Life cycle assessment – Requirements and guidelines. Berlin: Beuth publisher. October 2006
- DIN V 18599: Energy efficiency of buildings – Calculation of the energy needs, delivered energy and primary energy for heating, cooling, ventilation, domestic hot water and lighting. Berlin: Beuth publisher. May 2013
- DIN EN 15804:2014-07 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. Berlin: Beuth publisher. July 2014
- DIN EN 15978:2012-10 Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method. Berlin: Beuth publisher. October 2012
- German Federal Ministry of Transport, Building and Urban Development (BMVBS): *Baustoff- und Gebäudedaten [Construction material and building data]. Ökobau.dat. Berlin*
- Kreißig, J., Binder, M. *Methodische Grundlagen – Ökobilanzbasierte Umweltindikatoren im Bauwesen* [Methodical principles – Environmental indicators based on life cycle assessments in construction]. Methodology report for the BMVBS project *"Aktualisieren, Fortschreiben und Harmonisieren von Basisdaten für das nachhaltige Bauen"* [Updating, continuing and harmonising basic data for sustainable construction] (reference number 10.06.03–06.119) May 2007
- Guideline for Sustainable Building, Federal Office for Building and Regional Planning, Ministry of

Transport, Building and Housing Germany, 2001

- ”Guideline for sustainable buildings” on behalf of Ministry of Transport, Building and Housing, Germany 2001, 1st reprint (with editorial amendments)
- ASHRAE 140: 2011 - Building Thermal Envelope and Fabric Load Tests
- ANSI/ASHRAE/IES Standard 90.1-2013 Energy Standard for Buildings Except Low-Rise Residential Buildings
- EN ISO 52000-1: 2017 Energy performance of buildings — Overarching EPB assessment

EN ISO/TR 52000-2: 2017 Energy performance of buildings — Overarching EPB assessment Explanation and justification.

- http://files.designbuilder.cl/200000036-348f735887/DesignBuilder_v4.2_ASHRAE140_2.pdf
- http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.361.4714&rep=rep1&type=pdf

ENV1.2

Local environmental impact

Objective

Our objective is to reduce, avoid or substitute all dangerous or damaging materials, (construction) products or preparations that can adversely affect or cause short, medium or long-term damage to people, flora and fauna.

Benefits

The use of particularly environmentally friendly materials not only makes an important contribution to improving indoor air quality, but also helps limit the contamination risk of a building with regard to pollutants. Only a building elements catalogue, that is complete in terms of the environmental qualities of materials, can provide building owners with extensive information about construction products used in various parts of the building. This information is of key importance for the quality assurance in the building construction, for clarifying deficiencies and finding appropriate ways for eliminating them, simultaneously optimising the costs of maintenance. This provides an important contribution to the value stability of a building.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant			12.1.a 12.2	Sustainable consumption Sustainable production
Moderate	3.4 3.9 12.4 13.2	Reduction of premature death, promotion of good health/well-being Effects of chemicals, air, water and soil contamination Environmentally friendly handling of chemicals and waste Climate protection measures in guidelines, strategies and planning	3.2.a 13.1.a	Air pollution Climate protection

Outlook

The handling and use of environmentally friendly materials is subject to increasingly strict regulatory specifications. Categorisation into quality levels is subject to changes in the long term. In addition beside the standard quality levels (QL), for this international version another quality level Zero (QL0) was developed, which is the minimum requirement for this criterion.

Share of total score

	SHARE[1]	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	**4.7%**	**4**
Consumer market **Department stores**		
Logistics **Production**		
Shopping centre	**4.5%**	**4**
Assembly buildings	**5.0%**	**4**

[1] Variable, building location related factors from the criterion ENV2.2 may influence the share of total score

EVALUATION

The Quality Levels (QL) named in the criteria matrix build upon each other. The quality level achieved is derived from the individual aspect that needs to be given the lowest evaluation. The requirements of a higher quality level in each case incorporate all requirements listed for the lower levels. A maximum of 100 points can be awarded for this criterion.

NO.	INDICATOR	POINTS
1	**Environmentally friendly materials**	
1.1	**Office** **Education** **Hotel** **Consumer market** **Logistics** **Production** **Assembly buildings**	
	■ Fulfilment of all requirements in the criteria matrix:	**Max. 100**
	QL 0	10
	QL 1	30
	QL 2	50
	QL 3	75
	QL 4	100
	Residential **Department stores**	
	■ Fulfilment of all requirements in the criteria matrix: Evaluation of the communal areas, building envelope and the living spaces/rental spaces is carried out via 1.1 and 1.2. If the fit-out standard achieved for the living spaces/rental spaces deviates from the standardised fit-out description, this must be evaluated separately via indicator 1.2 (for more information, see IV. Usage-specific description).	**Max. 50**
	QL 0	5
	QL 1	15
	QL 2	25
	QL 3	35
	QL 4	50
	Shopping centre	
	■ Fulfilment of all requirements in the criteria matrix: Evaluation of the communal areas and the building envelope.	**Max. 60**
	QL 0	5
	QL 1	15
	QL 2	25
	QL 3	40
	QL 4	60
1.2	**Residential** **Department stores**	
	■ Fulfilment of all requirements in the criteria matrix in at least 50% of the rental spaces (apartments) in:	**Max. 50**
	QL 0	5
	QL 1	15
	QL 2	25
	QL 3	40
	QL 4	50

NO.	INDICATOR	POINTS
	Shopping centre	
	■ Fulfilment of all requirements in the criteria matrix in at least 50% of the rental spaces in (for more information see IV. Usage-specific description):	**Max. 40**
	QL 0	5
	QL 1	15
	QL 2	25
	QL 3	35
	QL 4	40
1.3	**Office** **Education** **Hotel** **Shopping centre** **Consumer market** **Logistics** **Production** **Residential** **Department stores** **Assembly buildings**	
	Additional points for all quality levels:	**+10**
	Cooling is provided without halogenated/partially halogenated refrigerants	10

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPIs) include, in the case of positive evaluation of indicator 2, not using certain refrigerants for the communication or communicating selected relevant emission parameters for construction products used.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	No use of halogenated and partially halogenated refrigerants that are persistent by themselves or have persistent degradation products	[yes]
KPI 2	Emission profiles for construction products used, stating carcinogenic volatile organic compounds, formaldehyde and substances with LCI values (tested in accordance with CEN/TS 16516); corresponds to Level(s) indicator 4.1.2	[µg/m³], [-]

Synergies with DGNB system applications

- **DGNB BUILDINGS IN USE:** The application of the criteria matrix can be proven in a procurement guideline for the ongoing maintenance in criterion ENV9.2 "Procurement" from the DGNB scheme for buildings in use
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion ENV1.2 from the scheme for renovated buildings.
- **DGNB INTERIORS:** High synergies with criterion ENV1.2 from the scheme for interiors.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Certain substances, construction products and preparations are dangerous to the soil, air, groundwater and surface water and to people, flora and fauna. This concerns their entire life cycle – from manufacturing, processing on the construction site and use in the existing building to their disposal (dismantling, recycling, disposal in landfill). The local risks are evaluated on the basis of substances and products, as the toxicological impact categories for the environment and humans have not yet been recorded in the life cycle assessment due to lack of recording and evaluation processes.

II. Additional explanation

In the DGNB certification system, high-risk material and substance groups are investigated and evaluated individually and on the basis of products. The following material groups, among others, are currently taken into account (as products or as ingredients in compositions):

- Halogenated and partially halogenated refrigerants
- Halogenated and partially halogenated propellants
- Heavy metals
- Substances that fall under the Biocidal Products Directive (528/2012/EC)[2]
- Substances that fall under the Persistent Organic Pollutants (POPs) Regulation[3]
- Hazardous substances in accordance with the CLP Regulation (1272/2008/EC)[4]
- Organic solvents and plasticisers
- Substances of very high concern (SVHC in accordance with the European Chemicals Regulation (REACH) (1907/2006/EC))[5]

Chemicals/substances that are particularly dangerous in terms of the following toxic end points are classified as being of very high concern:

- Carcinogenic, mutagenic and toxic to reproduction (CMR),
- Persistent, bioaccumulating and toxic (PBT)[6],
- Very persistent and very bioaccumulating (vPvB) or
- Of similar concern (e.g. endocrine disruptors).

In accordance with the European Chemicals Regulation (REACH), suppliers must inform their customers if a product (e.g. an insulation tube for building technology) contains a substance listed in the candidate list in a concentration of more than 0.1% (w/w). This obligation is described in Article 33 of the European Chemicals Regulation (REACH) and applies once a substance is included in the candidate list[7]

[2] Information on biocides: https://echa.europa.eu/information-on-chemicals/biocidal-active-substances

[3] Regulation (EU) 2019/1021 on POPs: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R1021&from=EN for non-EU area internationally ratified Stockholm convection http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx

[4] Guidance on labelling and packaging in accordance with Regulation: https://echa.europa.eu/documents/10162/23036412/clp_labelling_en.pdf/89628d94-573a-4024-86cc-0b4052a74d65

[5] Candidate List of substances of very high concern: https://echa.europa.eu/candidate-list-table

[6] Persistence, bioaccumulation and toxicity assessment: https://echa.europa.eu/pbt

The substances and components that must be considered are specified and explained in the criteria matrix (Appendix 1).

For the requirement for limiting emissions of volatile organic compounds from products or their risk potentials during use, overlaps with regard to the VOC content of the product and the resulting release of VOCs by the product are derived. In criterion ENV 1.2 "Local environmental impact", the VOC content of the product is primarily evaluated, and the release of VOCs is only evaluated where there are no industry regulations regarding the VOC content (e.g. sealants). The quantitative emissions of volatile substance into the interior are considered in criterion SOC1.2 "Indoor air quality".

The CE marking symbolizes the conformity of the product with the applicable requirements that the European Community places on the manufacturer. With the CE marking, it is declared, from responsible person/organisation, that the product complies with all applicable EU regulations and that a corresponding conformity assessment procedure has been carried out.

Planning procedure:

From an early planning phase onwards, certain materials and components must be considered in terms of critical substances (see Appendix 1) and, where appropriate, suitable alternative designs must be assessed. By making informed choices when selecting construction materials, it is possible to mostly avoid using the hazardous substances and products specified in the criteria matrix without restricting the creative and functional planning process.

III. Method

Criterion ENV1.2 contains specific requirements for a wide range of construction materials. The requirements stated in Appendix 1 must be observed for all materials and components specifically listed in the table. These must be assessed with regard to all requirements listed in Appendix 1, and it may be the case that multiple rows are relevant to individual materials and components. The complete layer structure of all components must be specified on the basis of a building elements catalogue (see implementation example, Appendix 2). Auxiliary materials such as adhesive, primers, etc. must be added. Verifiable proof must be produced in accordance with the criteria matrix for all requirements that are to be verified at the target quality level (see Appendix 1, column: Type of documentation; requirement for verification of the individual aspects).

As a result of this, the following surfaces must be considered:

- Ground structures including foundations
- External wall structures
- Internal wall structures
- Floor and ceiling structures
- Roof structures
- Underground garages (are considered separately)

The following requirements for this criterion must be considered, verified and complied for the prefabricated construction materials/products listed below:

- Coatings applied at the factory for windows, façade components, doors, frames, radiators, partitions, ceiling systems, cooling pipes, etc.: In accordance with the objective (prevention of VOC emissions into the environment), compliance with the product limit values in the criteria matrix is considered to be a valid form of proof. Alternatively, compliance with the objective can also be ensured by the coater/operator of exhaust air post-treatment systems by proving compliance with statutory limit values in accordance with Directive 1999/13/EU on the basis of current, officially accepted monitoring logs.

- Coatings applied on the construction site: In accordance with the objective (prevention of VOC emissions into the environment), only compliance with the product limit values in the criteria matrix is considered to be a valid form of proof.
- Synthetic insulating materials with regard to halogenated propellants
- Aluminium and stainless steel components with regard to treatment with Cr(VI) compounds
- Refrigerants in cooling systems
- Plastic windows, floor coverings and wall coverings with regard to lead, cadmium and tin stabilisers
- Plastics, insulating materials, functional coatings, sealants, rubber products etc. with regard to substances of very high concern (SVHC in accordance with the European Chemicals Regulation (REACH))
- Floor coverings with regard to hazardous substances and emissions

  Load-bearing components made of wood such as laminated timber trusses, pillars/cross bars in support structures and window frames with regard to biocidal substances.
- Coatings applied in the factory to load-bearing and non-load-bearing structural elements of the wooden structure such as lacquers, varnishes, oils and waxes with regard to VOC.
- Coatings applied in the factory to wood and wooden materials such as façade and acoustic elements, doors, coverings on ceilings, floors and walls, parquet, staircases and windowsills, etc. with regard to VOC. Alternatively, compliance with the objective can also be ensured by the coater/operator of exhaust air post-treatment systems by proving compliance with statutory limit values in accordance with Directive 1999/13/EU on the basis of current, officially accepted monitoring logs.

It should be noted here that in the criteria matrix (Appendix 1) are only requirements listed that go beyond the statutory material standards. Fulfilment of all national specific statutory requirements will always be considered as prerequisites by any building project claiming compliance to this document e.g. fulfilment of European Chemicals Regulation (REACH) by the manufacturers from EU member countries.

The qualitative evaluation is carried out based on quality levels. These are based on both the cost and level of difficulty of practical implementation and the environmental significance of substituting a material. All materials and aspects considered in the criteria matrix must be verified with regard to the target quality level. Only verified qualities can be taken into account and evaluated in the conformity check. The quality level achieved is derived from the individual aspect that needs to be given the lowest evaluation. The requirements of a higher quality level in each case incorporate all requirements listed for the lower levels.

The form of verification used is also crucial for determining the quality level. The verification must be implemented in the form of a building elements catalogue that includes the environmental qualities of materials.

The DGNB has learned over many years of experience that the material qualities required to fulfil **quality level 3** or **4** can only be successfully ensured if the materials relevant for fulfilling the quality level are tested and approved on the construction site prior to their use. **Quality level 3** or **4** can therefore only be achieved if the corresponding **material monitoring logs** are presented. Material inspection and creation of the logs can be delegated to qualified third parties (auditors, construction ecologists).

Material inspections on the construction site

An approval list must be regularly updated by the qualified institution responsible for review and approval and must be made available to the construction managers/property monitoring specialists for material inspection on the construction site. The construction managers/property monitoring specialists must monitor the correctness of the materials used by the companies involved in the construction by means of regular target/achieved comparisons and create logs of the results. An appropriate and regular frequency is considered to be one that ensures

- that the work of all contractors involved in all parts of the construction process involving relevant materials is checked soon after it begins (i.e. before 5% of the work that is critical for meeting objectives is completed), and
- that the intervals between inspections are reduced once fit-out work is started.

Information regarding dealing with incorrect use is provided in Appendix 5.

Certification of the construction site inspections is not required in order to achieve quality level 0, 1 or 2. It can therefore be assumed that it is not necessary to carry out construction site inspections for **quality level 0, 1** or **2** if it is only necessary to comply with the limit value in criterion SOC1.2 Indoor air quality.

IV. Usage-specific description

Information regarding indicator 1.1:
In the following schemes, separate evaluation of the rental spaces is possible via indicator 1.2. This corresponds to the methodology for indicator 1.1, which is to be used to evaluate the building envelope and any existing communal areas.

Residential **Department stores**:
Separate evaluation of the rental spaces is possible via indicator 1.2. This corresponds to the methodology for indicator 1.1, which is to be used to evaluate the building envelope and communal areas.

If the fit-out standard that has been implemented for the rental/living spaces deviates from the standardised fit-out description, these must be considered via indicator 1.2. Declarations of obligation and binding fit-out descriptions from tenants and confirmations of implementation of the quality level in accordance with the DGNB criteria matrix must be verified.

For department store with a tenant, a separate evaluation does not have to be carried out.

If no separate analysis is carried out, the points for indicators 1.1 and 1.2 can be awarded accordingly. In this case, a separate list is not required.

The quality level of the rental spaces can in principle only be assessed higher than the quality level that has been achieved for the communal areas if documentation for the rental/living spaces in accordance with the requirements specified for verification in the criterion and Appendix 2 is available and has been implemented successfully.

Shopping centre
Communal spaces and building envelopes are evaluated via indicator 1.1, while rental spaces are evaluated via indicator 1.2.

Communal areas and building envelope:
Communal areas include all non-rental spaces. These include spaces such as escape routes, parking areas, communal WC areas, office spaces and communal social areas. All non-retail spaces such as storage spaces that are fitted out by the landlord must be included in the communal spaces. The building envelope is also included.

Information regarding indicator 1.2:
Rental spaces:
If it can be verified that the relevant tenants have undertaken to implement the quality levels of the criteria matrix in at least 50% of the rental space, this is positively evaluated. This can be achieved, for example, via an obligation on the part of the tenants in the rental contract.

The quality level of the rental spaces can in principle only be assessed higher than the quality level that has been achieved for the communal areas if documentation for the rental/living spaces in accordance with the requirements specified for verification in the criterion and Appendix 2 is available and has been implemented successfully.

Information regarding indicator 1.3:
In order to provide an additional market incentive, implementation of cooling without halogenated/partially halogenated refrigerants is rewarded with additional checklist points. If no refrigerants are used, no additional checklist points can be awarded. The objective, in particular, is preventing the use of halogenated refrigerants or propellants, unless it has been proven that they and their degradation products do not accumulate in the environment and do not have persistent degradation products that can pollute (accumulate in) natural basins or have harmful effects there.

Assembly buildings

In case of existence of the individual/separated responsibilities between the parties e.g. owner: common areas and building envelope / tenant: rental areas, evaluation of the criterion for the scheme **Assembly buildings** can be done similarly to the scheme **Shopping centre**, where the "General areas and building envelope" are assessed in accordance to the indicator 1.1 and the "rental areas" assessed in accordance the indicator 1.2.

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators. The components/construction materials and areas listed in the criteria matrix (Appendix 1) must be considered:

- Complete declaration and verification of relevant components/construction materials applied in points or lines (e.g. sealant) using the documentation required in the criteria matrix. In principle, the verification process should deal with all consecutive numbers in the criteria matrix. Irrelevant aspects of the criteria matrix should be explicitly identified as irrelevant, and technical exceptions should be explicitly marked as exceptions and justified.
- Declaration and verification of relevant components/construction materials applied across surfaces in the form of a building elements catalogue that includes the environmental qualities of materials in accordance with Appendix 2 is obligatory in all quality levels (QL). Verification can also be submitted in a different form, as long as this clearly demonstrates the installation site (location/component/layer structure) of all materials considered in "Appendix 1 – Criteria matrix" to an equivalent extent as a building elements catalogue (in accordance with Appendix 2) and covers all components in the life cycle assessment with identical component designation and area assignment (due to traceability via the conformity check).
- The materials, products and elements listed in the documentation of criterion ENV1.2 must contain the following information as a minimum:
    - Construction product
    - Manufacturer
    - Area information (for materials applied across surfaces)
    - Description of the individual layers (see implementation example in Appendix 2: Building elements catalogue)
- Tenant fit out obligations (if required in the scheme)
- Construction site logs for the material inspections (obligatory for quality level 3 and 4)
- Target/achieved comparison in addition to the approval list (obligatory for quality level 3 and 4)
- Notification of defects/notification that the building is free from defects in accordance with Appendix 5 (in the event of incorrect use)

Exceptions for the verification process:

- **Quality levels 0 and 1:**

  No exceptions available in the **QL0** and **QL1,** i.e., all requirements listed in the matrix for these quality levels must be fulfilled.

- **Quality level 2:**

  For verification of quality level 2, two of the criteria (row of the criteria matrix) can be ignored without impacting the maximum evaluation points. Any further exception of the criteria (row of the criteria matrix) will lead to subtraction of five points (-5 points).
  The ignored criterion in the criteria matrix must fulfil the requirements of the **QL1** as a minimum.

- **Quality level 3:**

  For verification of quality level 3, three of the criteria (row of the criteria matrix) can be ignored without impacting the maximum evaluation points. Any further exception of the criteria (row of the criteria matrix) will lead to subtraction of five points (-5 points).
  The ignored criterion in the criteria matrix must fulfil the requirements of the **QL1** as a minimum.

- **Quality level 4:**

  For verification of quality level 4, a total of three of the criteria (rows of the criteria matrix) can be ignored without impacting the maximum evaluation points. Any further exception of the criteria (row of the criteria matrix) will lead to subtraction of five points (-5 points).
  The ignored criteria in the criteria matrix must each fulfil the requirements of the **QL1** as a minimum.

- **Cut-off criteria:**

  The verification can be ignored for max. 5% of the GFA(S) in accordance with [T&D_04], but only if explicitly mentioned; This applies regardless of which building areas the product/material is used on (see criteria matrix Appendix 1: "Scope of application and verification").

- **Example of the process:**
  - Building with a GFA(S) of 50,000 m² (incl. areas below the ground floor, such as underground garages)
  - Example result:
    5% GFA(S) = 2500 m²
  - Application: The verification of the criteria marked in the criteria matrix with this exception may exclude up to 2,500 m² area from the documentation. The location (walls, ceilings, floors, etc.) of the materials/products is not relevant here.

- **Technical and functional exceptions[8]:**

  If one of the specified product requirements cannot be implemented for technical or functional reasons (i.e. due to the absence of a functionally equivalent product or a construction alternative that meets the requirements), exceptions from the requirements are permitted. Any deviation from the requirements must be documented and justified, specifying the product, the technical application and the quantity used. Product exceptions for purely aesthetic reasons are not covered by the exemption. Possible forms of documentation include, for example, a current confirmation from at least three market-relevant manufacturers that no product that is suitable for the intended quality level is available (see Appendix 3), or proof that use of a suitable product was not technically possible for reasons attributable to "force majeure" (weather conditions, natural circumstances such as water under pressure in the construction site subsoil). Verification for a technical exception can only pertain to a single quality level and does not constitute an exemption from the requirements that may apply in the quality levels below it. If the requirement of a lower quality level cannot be met for technical reasons, this must be consistently justified on the basis of the three manufacturer confirmations presented for the technical exception.

- **Data basis:**

  In principle, the following can be used as a data basis:
  - Technical information
  - Safety data sheets (SDS)
  - Environmental Product Declarations of types I and III and manufacturer declarations regarding ingredients and recipe components
  - Manufacturer declaration
  - SVHC declaration by manufacturers of products (cf. Appendix 4)

  The most suitable sources for the material qualities that are to be queried within the scope of criterion ENV1.2 are normally:

  - VOC content of paints/lacquers: Technical information, safety data sheets, labels (declaration of the VOC content in accordance with Directive 2004/42/EC); specified in g/l
  - VOC content of other products: Manufacturer declaration
  - SVHC in preparations: Safety data sheet

[8] Not technical exception for QL 0 is possible

- SVHC in products: Technical information, manufacturer data sheets (obligation on the part of the manufacturer)
- Individual substances (heavy metals, etc.): Manufacturer declaration (see criteria matrix in Appendix 1; column: "Type of documentation/requirement for verification of individual aspects")

- **Validity of the data basis for verification:**

  The following information is required for verification:

  - EC safety data sheets in accordance with EC 1907/2006.
  - Declarations of SVHC in products in accordance with Annex XIV EC 1907/2006 in the most recent applicable version at the publication date of this DGNB version.
  - Declarations of substances in the SVHC candidate list in products in accordance with the most recent applicable version at the publication date of this DGNB version.

  This means that the documentation that is produced must be created on the basis of the data basis or substance lists (e.g. SVHC) available at the time of publication of this version. This is only ensured if currently valid safety data sheets, technical data sheets and manufacturer declarations that comply with legislation regarding chemicals are used. Documentation published at a later date can be used for verification.

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
all	General and evaluation: scheme “Assembly buildings” has been added	16.09.2021
126	Note has been added regarding the variability of the total score	16.09.2021
132	Additional explanation: definition of the CE marking added	16.09.2021
135	Usage-specific description: optional evaluation rule for the scheme “Assembly buildings” has been added	16.09.2021
All	Appendix 1: introduction of the PCB restriction and CE marking for paints, resins, sealants for QL0 (min. requirement for this criterion).	16.09.2021
144	Line #19: “cut off” rule has been introduced, relevant only if coated area >10 m²	16.09.2021
145	Line #25: no use of Tar / Tar product has been added for QL0	16.09.2021
148	Lines #47 and 48: has been added (Formaldehyde for wooden products)	16.09.2021
148	Note regarding the Taxonomy regulation for the Lines #47/48 has been added	
139	Exception rule for the QL0 and 1 has been updated	

II. Literature

Fundamental sources chosen from the available lists of substances and material data:

- CLP Regulation 1272/2008/EC including alignment regulations*
- European Chemicals Regulation (REACH) (EC 1907/2006) *
- Biocidal Products Directive 98/8/EC *
- Independently verified declarations, such as Environmental Product Declarations (EPD)
- Certifications developed within industries
- EC (2010): Consolidated list of substances that are no longer allowed to be sold, published and continuously updated by the European Commission
- SVHC – Substances of Very High Concern, also known as the REACH candidate list: (http://echa.europa.eu/web/guest/candidate-list-table)
- Sustainable Development Goals icons, United Nations/globalgoals.org
- REGULATION (EC) No 850/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004
- Guidance on labelling and packaging in accordance with Regulation (EC) No 1272/2008
- ECHA - Persistence, bioaccumulation and toxicity assessment: https://echa.europa.eu/pbt
- Implementation and review of DIRECTIVE 2004/42/EC, final report, 10 Nov. 2009
- Cadmium in general and copper based paints, ECHA report, 19 Nov. 2012
- ISO 12944 an international standard on corrosion protection of steel structures by protective paint systems, 2018
- Blue Angel – the German eco label, basic award criteria, edition Feb. 2011
- Annex XVII to REACH on: Lead and its compounds in articles, ECHA, Entry 63 (paragraphs 7 to 10)
- The EU-GHS Hazard statements, REACH Compliance GmbH

*For all statutory lists and material information, the currently valid version at the time the building application is submitted must be referred to. For statutory provisions, the transitional periods for placing on the market and use apply in each case.

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
	Where specifically does this apply?	Product type	Explanation	Definition	Limit value 10 points	Sub-Reference 30 points (verification via building elements catalogue)	Reference 50 points (verification via building elements catalogue)	Sub-target 75 points (verification via building elements catalogue)	Target value 100 points (verification via building elements catalogue)	Requirement for verification of the individual aspects (only documentation containing values that are to be verified should be submitted)	The requirement applies to the following components		Raw materials extraction (A1)	Production of the product (A3)	Construction of the building (A5)	Operation/use of the building (B1)	Dismantling of the building (C1-C4 and D)	Typical HOAI phase of implementation (German fee structure for architects and engineers)
	General information: **1) For all standards, references, test seals, etc. listed below, legally valid proof of equivalence with regard to the substance or aspect considered (see column 4) will be accepted. This legally valid proof can be provided by the manufacturer or the authority responsible for awarding the test seal.** **2) The requirements of the specified "reference standards" (see column 5) generally apply to the statutory requirements that are predominantly shown in quality level 0 and 1. Requirements outside of this do not always refer to the reference standard. The requirements of a higher quality level in each case incorporate all requirements listed for the lower levels; higher quality levels (QL) may require additional requirements and quality standards.** **The QL0 is an absolute min. requirement for this criterion. Stockholm POP Convention (restrictions of substances listed under the Annex A, B and C) must be considered as the mandatory worldwide requirement.**											**Legally valid proof**	Reference to the DGNB criterion					
													ENV 1.3 "Sustainable resource extraction"			SOC 1.2 "Indoor air quality"	TEC 1.6 "Ease of recovery and recycling"	
1	Coatings on non-mineral sub-surfaces: Metals, wood, plastics (Factory and building site)	This refers to decorative liquid coating materials: Paints/varnishes with primer coats. Effect coatings (such as metallic paints) are an exception to this	VOC/ heavy metals / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of lead and cadmium compounds, and no use of PCBs (polychlorinated biphenyl) or CE marking	< 300 g/l – (Category D - Solvent-borne coatings (SB) in accordance with Directive 2004/42/EC)	< 130 g/l – (Water-borne coatings (WB))Cat. D in accordance with Directive 1004/42/EC)	< 100 g/l	< 100 g/l	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products	Please note: Coatings applied at the factory	Risk minimisation in solvent manufacturing			Indoor air hygiene		Work stage 5–9
2	Coatings on predominantly mineral interior sub-surfaces as well as on wallpaper, non-woven materials, plasterboard, etc. Floor areas with special resistance requirements (such as OS (surface protection) systems) and traffic routes such as underground garages and access roads are not taken into account	This refers to decorative paints, primers, decorative fillers (incl. Q-filler) and deep primer, floor coatings with no special resistance requirements, concrete glazes	VOC/SVOC/ heavy metals / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of lead and cadmium compounds and no use of PCBs (polychlorinated biphenyl) or CE marking	In accordance with the requirements for water-borne (WB) products in accordance with the Directive 2004/42/EC (Appendix II)	< 30 g/l	- Solvent-free (≤ 0.7 g/l) and - plasticiser-free (≤ 0.7 g/l)	- Solvent-free (≤ 0.7 g/l) and - plasticiser-free (≤ 0.7 g/l)	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products. For max. 5% of the GFA(S).					Indoor air hygiene		Work stage 5–9
3	Coatings on predominantly mineral interior sub-surfaces such as concrete, masonry, mortar and filler (e.g. concrete filler). Floor areas with special resistance requirements (such as OS (surface protection) systems) and traffic routes such as underground garages and access roads, as well as floor screed intended for use without additional coverings and decorative screeds are not taken into account.	This refers to dust-binding coatings and primer coats such as the 'Betonkontakt' or 'Aufbrennsperre' products	VOC/ heavy metals / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of lead and cadmium compounds and no use of PCBs (polychlorinated biphenyl) or CE marking	< 30 g/l	< 30 g/l	< 10 g/l	< 5 g/l	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products. For max. 5% of the GFA(S).					Interior air hygiene		Work stage 5–9
4	Wall and ceiling linings	Wallpaper paste	VOC	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2		- Powder products or - solvent-free dispersion adhesives (≤ 0.7 g/l)	- Powder products or - solvent-free dispersion adhesives (≤ 0.7 g/l)	- Powder products or - solvent-free dispersion adhesives (≤ 0.7 g/l)	- Powder products or - solvent-free (≤ 0.7 g/l) and plasticiser-free (≤ 0.7 g/l)	Technical data sheet and/or SDS	All relevant components and construction products					Indoor air hygiene		Work stage 5–9
5	Coating materials for exterior mineral surfaces such as concrete, masonry, mineral mortar and filler, plaster, ETICS, wallpaper (façade wallpaper), plasterboard, etc.	Currently, decorative paints and dispersion insulation adhesive are taken into account	VOC/ heavy metals / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of lead and cadmium compounds and no use of PCBs (polychlorinated biphenyl) or CE marking	< 40 g/l	< 40 g/l	< 40 g/l	< 40 g/l	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products							Work stage 5–9

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
6	Floor coverings (Factory)	Textile floor coverings	VOC/ hazardous substances	Stockholm POP Convention and SVHC from the REACH candidate list as well as Biocidal Products according 528/2012/EC	SVHC ≤ 0.1%	< 250 µg/m³ after 3 days or < 100 µg/m³ after 28 days and SVHC ≤ 0.1% and biocidal products only in accordance with 528/2012/EC	< 250 µg/m³ after 3 days or < 100 µg/m³ after 28 days and SVHC ≤ 0.1% and biocidal products only in accordance with 528/2012/EC	< 250 µg/m³ after 3 days or < 100 µg/m³ after 28 days and SVHC ≤ 0.1% and biocidal products only in accordance with 528/2012/EC	< 250 µg/m³ after 3 days or < 100 µg/m³ after 28 days and SVHC ≤ 0.1% and biocidal products only in accordance with 528/2012/EC	Technical data sheet and/or Documentation of emissions according to EN ISO 16000-28 and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All floor coverings					Indoor air hygiene	Prevention of risk materials and impurities in recycling	Work stage 5–9
7	Floor coverings (Factory)	Resilient floor coverings	VOC/SVOC/ heavy metals	REACH, SVHC / Chlorinated paraffins (incl. long chain CPs) Stockholm POP Convention	No use of lead and cadmium compounds	Documentation of emissions	Documentation of emissions and < 0.1% chlorinated paraffins	Documentation of emissions and < 0.1% chlorinated paraffins and ≤ 0.1% phthalates that are toxic to reproduction (= SVHC)	< 1000 µg/m³ after 3 days or < 300 µg/m³ after 28 days and CPs < 0.1% and SVHC ≤ 0.1%	Technical data sheet and/or manufacturer declaration and additionally, for QL 4: Documentation of emissions according to EN ISO 16000-9/ EN 16516 and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All floor coverings	Documentation of emissions Chlorinated paraffins				Indoor air hygiene	Prevention of risk materials and impurities in recycling	Work stage 5–9
8	Primers, precoats, joint mortars, fillers and adhesives under wall and floor coverings (e.g. tiles, carpets, parquet, resilient floor coverings – with the exception of wallpaper)	All installation materials, auxiliary materials for installing surfaces (wall and floor)	VOC/ hazardous substances	Solvent: Boiling point (b.p.) ≤ 200 °C Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking	Solvent free products (solvent content ≤ 0.5%) Exception: Epoxy resin products (solvent content ≤ 10%)	Solvent free products (solvent content ≤ 0.5%) Exception: Epoxy resin products (solvent content ≤ 10%) and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days	Solvent free products (solvent content ≤ 0.5%) Exception: Epoxy resin products (solvent content ≤ 10%) and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days	Solvent free products (solvent content ≤ 0.5%) Exception: Epoxy resin products (solvent content ≤ 10%) and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate according to EN ISO 16000-1/9 /EN 16516 and/or reference product **labels** in the DGNB System https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products					Indoor air hygiene		Work stage 5–9
9	Barrier coatings, resin screeds, seals under tiles	Auxiliary materials for installation	VOC/ hazardous substances	Solvent: Boiling point (b.p.) ≤ 200 °C Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking	Solvent free products (solvent content ≤ 0.5%) Exception: Epoxy resin products (solvent content ≤ 10%)	Solvent free products (solvent content ≤ 0.5%) Exception: Epoxy resin products (solvent content ≤ 10%)	Solvent free products (solvent content ≤ 0.5%) Exception: Epoxy resin products (solvent content ≤ 10%) and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days	Solvent free products (solvent content ≤ 0.5%) Exception: Epoxy resin products (solvent content ≤ 10%) and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate according to EN ISO 16000-1/ EN 16516 and/or reference product **labels** in the DGNB System https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products. For max. 5% of the GFA(S, no documentation is required.					Indoor air hygiene		Work stage 5–9
10	Natural stone floorings	Impregnations in the interior that do not form films (e.g. natural stone impregnations, sandstone strengthener)	VOC	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2		Free of aromatic substances (< 1%)	Free of aromatic substances (< 1%)	Free of aromatic substances (< 1%)	Solvent content < 5%, not subject to labelling requirements	Technical data sheet and/or SDS and/or manufacturer declaration – in special cases (type of natural stone), a technical exception may be justifiable	All relevant components and construction products		Risk minimisation in solvent manufacturing					Work stage 5–9

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
11	Skirting boards, door rails, support adhesive (raised or hollow floors); The areas of glass construction, façade and fire safety are not taken into account here	Sealing compounds, sealants and adhesives for attaching components in points and lines in the interior. This refers to PU adhesive and silane modified polymers (SMP)	VOC / hazardous substances	Solvent: Boiling point (b.p.) ≤ 200 ° Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking	Polyurethane resin products, solvent content ≤ 10%	Polyurethane resin products, solvent content ≤ 10%	Polyurethane resin products, solvent content ≤ 10% and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days	Polyurethane resin products, solvent content ≤ 10% and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate according to EN ISO 16000-1/ EN 16516 and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products	GISCODE PU10 GISCODE RS10	Risk minimisation in solvent manufacturing			Indoor air hygiene		Work stage 5–9
12	Adhesive bonds on small joints under mechanical stress; the areas of glass construction, façade and fire safety are not taken into account here	Sealing compounds, sealants and adhesives for attaching components in points and lines in the interior and attaching ventilation ducts inside the building. This refers to Acrylic sealants/adhesives, silicone sealants and SMP (hybrid sealants)	Chlorinated paraffins, solvents, HC / hazardous substances	Chlorinated paraffins/solvents ((incl. long chain CPs)), hydrocarbon plasticisers Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking		No Chlorinated paraffins according to SDS	Chlorinated paraffins < 0.1%	Chlorinated paraffins < 0.1% Solvent < 1% and HC plasticisers < 0.1%	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products in the standard applications of sealing joints (tiles, natural stone), connection joints (drywall construction, paintwork, doors) and sealants for indoor air ventilation installations (RLT)	Chlorinated paraffins	Risk minimisation in solvent manufacturing			Interior air hygiene and prevention of hazardous substances		Work stage 5–9
13	Installation adhesives and sealants on the façade, windows and external doors (applied on the construction site)	Adhesive for establishing airtightness on the internal and external façade: e.g. PU, PU hybrid, MS polymer, SMP, etc.	Halogenated propellants, chlorinated paraffins , emissions and hazardous substances	Chlorinated paraffins (incl. long chain CPs)/ Solvent: Boiling point (b.p.) ≤ 200 ° Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking	< 0.1% halogenated propellants	< 0.1% halogenated propellants	- Chlorinated paraffins < 0,1 % and halogenated propellants < 0.1% and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days or - VOC < 1 %	- Chlorinated paraffins < 0,1 % and halogenated propellants < 0.1% and ≤ 1000 µg/m³ after 3 days or ≤ 100 µg/m³ after 28 days or - VOC < 1 %	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate according to EN ISO 16000-1/ EN 16516 and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products	Chlorinated paraffins	Risk minimisation in solvent manufacturing Prevention of refrigerants or propellants that are persistent by themselves or have degradation products that are persistent.*			Interior air hygiene and prevention of hazardous substances Prevention of refrigerants or propellants that are persistent by themselves or have degradation products that are persistent.*		Work stage 5–9
14	Concrete release agents	Mould oils and release agents for concreting	VOC	Solvent: Boiling point (b.p.) ≤ 250 °		Solvent free products (solvent content ≤ 0.5%)	Solvent free products (solvent content ≤ 0.5%)	Solvent free products (solvent content ≤ 0.5%)	Solvent free products (solvent content ≤ 0.5%) biodegradable products (e.g. rapeseed oil)	Technical data sheet and/or SDS and/or manufacturer declaration	All relevant components and construction products		Risk minimisation in solvent manufacturing		Soil and groundwater protection			Work stage 5–9
15	Load-bearing and non-load-bearing metal components for indoor applications with > 50 m² coated surface (Factory and building site)	Fire safety coating for metal components	VOC, emissions and halogens / heavy metals / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of lead, cadmium, chromium (VI) compounds and No use of PCBs (polychlorinated biphenyl) or CE marking		Halogen-free product and VOC < 50 g/l	Halogen-free product and VOC < 25 g/l	Halogen-free product and VOC < 1 g/l	Technical data sheet and/or SDS and/or manufacturer declaration	Plant and construction site	DIBt principles Explanation: In the event of optional use of top coats in accordance with national technical approval (abZ) VOC < 60 g/l		Minimisation of solvent emissions into the environment				Work stage 5–9
16	Load-bearing metal components (wall thickness > 3 mm) with > 500 m² coated surface in the building such as atrium construction, bridges, etc. (Factory and building site)	Corrosion protection coatings for internal components (max. Corrosion classC2 according to ISO 12944)	VOC / heavy metals / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of lead, cadmium, chromium (VI) compounds and No use of PCBs (polychlorinated biphenyl) or CE marking	< 300 g/l	Water-borne product <140 g/l (cat. A/i or A/j in accordance with the Decopaint Directive)	Water-borne product <140 g/l (cat. A/i or A/j in accordance with the Decopaint Directive)	Water-borne product < 100 g/l or use of a C3 coating system of quality level 4 (see next row)	Manufacturer declaration Note: The requirements in terms of corrosion protection for load-bearing components must be collectively considered to be	Plant and construction site			Minimisation of solvent emissions into the environment				Work stage 5–9

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
17	Load-bearing metal components (wall thickness > 3 mm) with > 500 m² coated surface such as atrium construction, bridges, etc. (Factory and building site)	Corrosion protection coatings for components (max. Corrosion classC3 according to ISO 12944)	VOC / heavy metals / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of lead, cadmium, chromium (VI) compounds and No use of PCBs (polychlorinated biphenyl) or CE marking	Coating system with VOC < 120 g/m²	Coating system with VOC < 90 g/m²	Coating system with VOC < 60 g/m²	Coating system with VOC < 30 g/m² or use of a coating system of C4 or higher, (see next row)	a single criterion with regard to exemptions (for quality levels 3 and 4).	Plant and construction site			Minimisation of solvent emissions into the environment				Work stage 5–9
18	Load-bearing metal components (wall thickness > 3 mm) with > 500 m² coated surface such as atrium construction, bridges, etc. (Factory and building site)	Corrosion protection coatings for components (Corrosion class higher than C3 according to ISO 12944)	VOC / heavy metals / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of lead, cadmium, chromium (VI) compounds and No use of PCBs (polychlorinated biphenyl) or CE marking	Coating system with VOC < 150 g/m²	Coating system with VOC < 120 g/m²	Coating system with VOC < 90 g/m²	Coating system with VOC < 60 g/m²		Plant and construction site			Minimisation of solvent emissions into the environment				Work stage 5–9
19	Non-load-bearing metal components such as banisters, metal substructures, frames, steel doors, façade elements and heat and cold transfer surfaces (Factory and building site)	Corrosion protection coatings and effect coatings (e.g. metallic effect paints)	VOC / hazardous substances	VOC definition in accordance with Directive 2004/42/EC VOC content: ISO 11890-2 Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking	< 300 g/l Category A/d in accordance with Directive 2004/42/EC	< 300 g/l Category A/d in accordance with Directive 2004/42/EC	Water-borne products < 140 g/l Exception: For metallic effect paints < 300 g/l – Category A/d in accordance with Directive 2004/42/EC	Water-borne products < 140 g/l Exception: For metallic effect paints < 300 g/l - Category A/d in accordance with Directive 2004/42/EC	Technical data sheet and/or SDS	Plant and construction site for >10 m² coated area			Minimisation of solvent emissions into the environment				Work stage 5–9
20	Reactive PU products for coating mineral floor, ceiling and wall surfaces – including in system structures with no special requirements	Seals, 2K PU paints, PU floor coatings - with the exception of OS (surface protection) systems for car parks, etc.	VOC, hazardous substances	Solvent: Boiling point (b.p.) ≤ 200 ° Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking	Solvent free PU products (solvent content ≤ 0.5%)	Solvent free PU products (solvent content ≤ 0.5%)	Solvent free PU products (solvent content ≤ 0.5%) and - documentation of emissions	Solvent free PU products ≤ 0.5% and - documentation of emissions	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate according to EN ISO 16000-9 / EN 16516 and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products. For max. 5% of the GFA(S), no documentation is required.	GISCODE PU10 Documentation of emissions as an individual product or in the system AgBB test certificate	Risk minimisation in solvent manufacturing		Minimisation of solvent emissions into the environment	Indoor air hygiene		Work stage 5–9
21	Coatings for wood surfaces: parquet, staircases and other floor coverings	Products for surface coating	VOC	Solvent: Boiling point (b.p.) ≤ 250 °		Water-borne wood floor finish with or without isocyanate-containing hardener Solvent content: ≤ 15%	Water-borne wood floor finish with or without isocyanate-containing hardener Solvent content: ≤ 15%	Water-borne wood floor finish with or without isocyanate-containing hardener Solvent content: ≤ 5%	Water-borne wood floor finish with or without isocyanate-containing hardener Solvent content: ≤ 5%	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products				Minimisation of solvent emissions into the environment	Indoor air hygiene		Work stage 5–9
22	PMMA and PMMA/epoxy coatings for floor and wall surfaces (e.g. skirting boards) with special requirements and liquid plastic	Industrial floorings, parking areas and underground garages, with the exception of markings (not regulated) and liquid plastics for sealing rising components or kitchens	VOC, hazardous substances	Solvent: Boiling point (b.p.) ≤ 200 ° Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking			Solvent free products (solvent content ≤ 0.5%)	Solvent free products (solvent content ≤ 0.5%)	Technical data sheet and/or SDS and/or manufacturer declaration	All relevant components and construction products		Risk minimisation in solvent manufacturing		Minimisation of solvent emissions into the environment			Work stage 5–9
23	"EP-products for coating mineral surfaces: "floors, ceilings and walls – including in system structures with no special requirements	Seals, 2K EP paints, EP floor coatings – with the exception of OS (surface protection) systems for car parks, etc.	VOC, hazardous substances	Solvent: Boiling point (b.p.) ≤ 200 ° CLP Regulation (1272/2008/EC) Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking	EP products, solvent content: ≤10%	EP products, solvent content: ≤10%	EP products, solvent content: ≤10%and - documentation of emissions No Hazard statements (300/400) according to CLP Regulation (1272/2008/EC)Exception H317	EP products, solvent content: ≤10%and - documentation of emissions No Hazard statements (300/400) according to CLP Regulation (1272/2008/EC) Exception H317	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate according to EN ISO 16000-9 / EN 16516 and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products For max. 5% of the GFA(S, no documentation is required	Documentation of emissions as an individual product or in the system AgBB test certificate	Risk minimisation in solvent manufacturing		Minimisation of solvent emissions into the environment	Indoor air hygiene		Work stage 5–9

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
24	EP/PU primers (including asphalt screeds) and coatings for floor and wall surfaces (e.g. skirting boards) with special requirements	Industrial floorings, parking areas and underground garages (OS (surface protection) 8 , 10, 11 among others) with the exception of markings (not regulated)	Solvents / hazardous substances	Solvent: Boiling point (b.p.) ≤ 200 ° Stockholm POP Convention	No use of PCBs (polychlorinated biphenyl) or CE marking	EP/PU products, solvent content: ≤10%	EP/PU products, solvent content: ≤10%	EP/PU products, solvent content: ≤10%	EP/PU products, solvent content: ≤10%	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate according to EN ISO 16000-9 / EN 16516	All relevant components and construction products	GISCODE PU10	Risk minimisation in solvent manufacturing		Minimisation of solvent emissions into the environment			Work stage 5–9
25	Roof sealing, sealing of buildings against soil/water/moisture, thick bitumen coating and insulating material installation	Coating products that can be processed cold (e.g. precoats) and auxiliary materials for installation (e.g. adhesive, sealants)	Bitumen / Tar	Solvent: Boiling point 135–250 °C CLP Regulation (1272/2008/EC)	free of tar and tar products	Bitumen products, solvent content: ≤ 25% and No Hazard statements (300/400) according to CLP Regulation (1272/2008/EC) Exceptions: 315, 319, 336, 412.	Bitumen products, solvent content: ≤ 25% and No Hazard statements (300/400) according to CLP Regulation (1272/2008/EC) Exceptions: 315, 319, 336, 412.	Bitumen emulsions, organic solvents: ≤ 3% and No Hazard statements according to CLP Regulation (1272/2008/EC)	Bitumen emulsions, organic solvents: ≤ 3% and No Hazard statements according to CLP Regulation (1272/2008/EC)	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products		Risk minimisation in solvent manufacturing		Minimisation of solvent emissions into the environment	Indoor air hygiene		Work stage 5–9
26	Bituminous compound sealants for inverted roofs	Bitumen primer	Bitumen / Tar	Solvent: Boiling point 135–250 °C CLP Regulation (1272/2008/EC)	free of tar and tar products	Bitumen products, aromatics content: ≤ 25% No Hazard statements (300/400) according to CLP Regulation (1272/2008/EC) Exceptions: 304, 315, 319, 336, 411, 412.	Bitumen products, aromatics content: ≤ 25% No Hazard statements (300/400) according to CLP Regulation (1272/2008/EC) Exceptions: 304, 315, 319, 336, 411, 412.	Bitumen products, aromatics content: ≤ 25% No Hazard statements (300/400) according to CLP Regulation (1272/2008/EC) Exceptions: 304, 315, 319, 336, 411, 412.	Bitumen products, aromatics content: ≤ 25% No Hazard statements (300/400) according to CLP Regulation (1272/2008/EC) Exceptions: 315, 319, 336, 411, 412.	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products				Prevention of aromatic solvents			Work stage 5–9
27	Coatings for wood surfaces such as parquet, staircases and panelling	Products for coating wood	Oils and waxes	Solvent: Boiling point 135–250 °C		Free from aromatic compounds, solvent content ≤ 15%	Free from aromatic compounds, solvent content ≤ 5%	Solvent free: (solvent content ≤ 0%)	Solvent free: (solvent content ≤ 0%)	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products		Risk minimisation in solvent manufacturing		Minimisation of solvent emissions into the environment	Indoor air hygiene		Work stage 5–9
28	Load-bearing internal wood components together with outward-facing overhangs (Factory and building site)	Chemical wood protection load-bearing components	Wood preservative (product type 8 in accordance with 528/2012/EC)	528/2012/EC (Biocide regulation) Stockholm POP Convention	No use of Dichlorodiphenyltrichloroethane (DDT) and Pentachlorophenol (PCP) and Hexachlorocyclohexane (HCH) (Lindane)	Use Class* 0: Wood preservative for construction purposes only in accordance national "Building inspection approval" Use Class* 1–3: Marketable biocidal products in accordance with 528/2012/EC	Use Class* 0 and 1: Wood preservative for construction purposes only in accordance with national "Building inspection approval" Use Class* 2–3: Marketable biocidal products in accordance with 528/2012/EC	Wood preservative for construction purposes only in accordance with national "Building inspection approval" or natural durability in accordance with DIN EN 350-2	Wood preservative for construction purposes only in accordance with national "Building inspection approval" or natural durability in accordance with DIN EN 350-2	Planning, technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products	Wood preservative in accordance with 68800-2 or natural durability in accordance with DIN EN 350-2					Prevention of risk materials and impurities in recycling	Work stage 3–9
29	External load-bearing wood components (Factory and building site)	Chemical wood protection load-bearing components	Wood preservative (product type 8 in accordance with 528/2012/EC)	528/2012/EC (Biocide regulation) Stockholm POP Convention	No use of Dichlorodiphenyltrichloroethane (DDT) and Pentachlorophenol (PCP) and Hexachlorocyclohexane (HCH) (Lindane)	Use Class* 2–4: Marketable biocidal products in accordance with 528/2012/EC	Use Class* 2: Wood preservative for construction purposes only in accordance with national "Building inspection approval" Use Class* 3 and 4: Marketable biocidal products in accordance with 528/2012/EC	Use Class* 2: Wood preservative for construction purposes only in accordance with national "Building inspection approval" Use Class* 3 and 4: Marketable biocidal products in accordance with 528/2012/EC	Wood preservative for construction purposes only in accordance with national "Building inspection approval" or natural durability in accordance with DIN EN 350-2	Planning and/or technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate	All relevant components and construction products	Wood preservative in accordance with 68800-2 or natural durability in accordance with DIN EN 350-2					Prevention of risk materials and impurities in recycling	Work stage 3–9
30	Wooden windows and internal and external non-load-bearing wood components (e.g. façade and patio) (Factory and building site)	Chemical impregnation of non-load-bearing components	Wood preservative (product type 8 in accordance with 528/2012/EC)	528/2012/EC (Biocide regulation)	Internal: No chemical wood preservative Exception: Windows only with marketable biocidal products in accordance with 528/2012/EC	Internal: No chemical wood preservative Exception: Windows only with marketable biocidal products in accordance with 528/2012/EC	Internal: No chemical wood preservative Exception: Windows only with marketable biocidal products in accordance with 528/2012/EC	No chemical wood preservative in the interior and exterior Exception: Windows only with marketable biocidal products in accordance with 528/2012/EC	No chemical wood preservative in the interior and exterior Exception: Windows only with marketable biocidal products in accordance with 528/2012/EC	Technical data sheet and/or SDS and/or manufacturer declaration	Internal: All relevant components External: All relevant components and construction products. For max. 5% of the GFA(S), no documentation is required.						Prevention of risk materials and impurities in recycling	Work stage 3–9

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
31	Products with film preservation and goods treated with biocides	Exterior plasters, façade coatings, floor coverings made of wool/natural fibres, wood glazes with film preservation	Biocides (product type 7 and 9 in accordance with 528/2012/EC: Preservatives for construction materials) e.g. algicides, fungicides, moth repellents	528/2012/EC (Biocide regulation)					The following applies to NWO15: No internal use of biocidal substances with the exception of in-can preservation	Manufacturer declaration	All relevant components and construction products	Approved substance in accordance with 528/2012/EC Biocidal Products Directive					Prevention of risk materials and impurities in recycling	Work stage 3–9
32	All aluminium and stainless steel components in the building envelope with a total area as a component of > 5 m². Sun protection slats, roller shutter boxes and stainless steel railings are not taken into account. (Factory)	Products for passivation of aluminium and stainless steel	Chromium (VI)					Chromium (VI)-free passivating agents	Chromium (VI)-free passivating agents	Manufacturer declaration	All relevant building envelope components such as façade profiles, coverings and parapet plates					Soil and groundwater protection		Work stage 3–9
33	Coated metal components: Façade elements, doors, radiators and heating/cooling ceilings. Hot-dip galvanising is not considered to be a coating for the purposes of this criterion. (Factory and building site)	Primers and final coatings (e.g. paints, lacquers, powder coatings)	Lead, cadmium and chromium (VI)		No use of lead, cadmium and chromium (VI) compounds	No use of lead, cadmium and chromium (VI) compounds	No use of lead, cadmium and chromium (VI) compounds	No use of lead, cadmium and chromium (VI) compounds	No use of lead, cadmium and chromium (VI) compounds	SDS and/or manufacturer declaration	Components with coating applied at the factory with a coated area > 100 m² per component type (e.g. steel door) in the building			Prevention of hazardous waste (Cr(VI) baths)				Work stage 3–9
34	Roof covering, guttering, downpipes	Components conveying water on the roof and rainwater drainage	Lead, copper and zinc					Heavy metal filters, if area > 50m² of the projected roof area viewed from above	Heavy metal filters, if area > 50m² of the projected roof area viewed from above	Planning and/or manufacturer declaration and/or documentation in accordance with Umweltbundesamt (UBA) guideline 17/05	All relevant components and construction products					Soil and groundwater protection		Work stage 3–9
35	Plastics for installing surfaces (floor and wall) as well as components on the building envelope (Factory)	Resilient floor coverings (e.g. PVC, rubber), wall coverings, skylights, plastic windows, sound insulation inserts (e.g. façade brace)	Organolead and organostannic compounds		Lead content < 0.1% and tin content < 0.1%	Lead content < 0.1% and tin content < 0.1%	Lead content < 0.1% and tin content < 0.1%	Lead content < 0.1% and tin content < 0.1%	Lead content < 0.1% and tin content < 0.1%	Manufacturer declaration	All relevant components > 100 m² per product group / component type in the building; relevant is the merged area	Please note: Use of recycled materials					Prevention of risk materials and impurities in recycling	Work stage 5–9
36	Plastic films on roof and foundations (Factory)	Plastic films for sealing on roof and basement level external walls are taken into account	Organolead and organostannic compounds		Lead content < 0.1% and tin content < 0.1%	Lead content < 0.1% and tin content < 0.1%	Lead content < 0.1% and tin content < 0.1%	Lead content < 0.1% and tin content < 0.1%	Lead content < 0.1% and tin content < 0.1%	Manufacturer declaration	All relevant components > 100 m²	Please note: Use of recycled materials					Prevention of risk materials and impurities in recycling	Work stage 5–9
37	Cooling systems/ building technology/ split devices (Factory)	Refrigerants	Halogenated refrigerants		Additional evaluation point: Does not contain halogenated/ partially halogenated refrigerants	Additional evaluation point: Does not contain halogenated/ partially halogenated refrigerants	Additional evaluation point: Does not contain halogenated/ partially halogenated refrigerants	Additional evaluation point: Does not contain halogenated/ partially halogenated refrigerants	Additional evaluation point: Does not contain halogenated/ partially halogenated refrigerants	Building technology planning and/or manufacturer declaration	All relevant components and construction products		Prevention of refrigerants or propellants that are persistent by themselves or have degradation products that are persistent.*			Prevention of refrigerants or propellants that are persistent by themselves or have degradation products that are persistent.*		Work stage 3–9

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
38	Assembly foams B2 or E with insulating and attaching function (except for adhesive bonds of insulating materials)	In-situ and assembly foams for installing external doors and windows and for fittings, e.g. door frames	Halogenated and other propellants, solvents, plasticisers and flame retardants	REACH, SVHC / VOC	No use of halogenated propellants and TCEP	≤ 750 µg/m³ after 3 days or ≤ 60 µg/m³ after 28 days and - no use of halogenated propellants, chlorinated paraffins and TCEP	≤ 750 µg/m³ after 3 days or ≤ 60 µg/m³ after 28 days and - no use of halogenated propellants, chlorinated paraffins and TCEP	≤ 750 µg/m³ after 3 days or ≤ 60 µg/m³ after 28 days and - no use of halogenated propellants, chlorinated paraffins, and TCEP	≤ 750 µg/m³ after 3 days or ≤ 60 µg/m³ after 28 days and - no use of halogenated propellants, chlorinated paraffins, TCEP, plasticisers and halogenated flame retardants	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate according to EN ISO 16000-1/9 /EN 16516 and/or reference product **labels** in the DGNB System: https://www.dgnb-system.de/de/system/labelanerkennung/	All relevant components and construction products	Propellants REACH candidate list	Prevention of refrigerants or propellants that are persistent by themselves or have degradation products that are persistent.*			Prevention of refrigerants or propellants that are persistent by themselves or have degradation products that are persistent.*		Work stage 5–9
39	Assembly foams for insulating materials	Assembly foams e.g. for attaching ETICS, perimeter insulation, cellar ceiling insulation and flat roof insulation	Halogenated and other propellants	REACH, SVHC	No use of assembly foams (except for joints)	No use of assembly foams (except for joints)	No use of assembly foams (except for joints)	No use of assembly foams (except for joints)	No use of assembly foams (except for joints)	Documentation of the mineral adhesive, joint foam with no halogenated propellants (technical data sheet and/or SDS)	All relevant components and construction products		Prevention of refrigerants or propellants that are persistent by themselves or have degradation products that are persistent.*			Prevention of refrigerants or propellants that are persistent by themselves or have degradation products that are persistent.* Durability of the adhesive bond		Work stage 5–9
40	Synthetic insulating materials for buildings and building services	PS/XPS/PUR insulating products, flexible building technology insulation (rubber and PE)	Halogenated propellants	REACH	No use of halogenated propellants	No use of halogenated propellants	No use of halogenated propellants	No use of halogenated propellants	No use of halogenated propellants	Technical data sheet and/or manufacturer declaration	All components and construction products relevant for the building thermal envelope and the main parts of the building technical installations			Prevention of potent greenhouse gases				Work stage 5–9
41	Synthetic insulating materials (building and building services incl. heating and cooling surfaces)	PS/XPS, PUR/PIR, Resol panels	Flame retardant hexabromocyclododecane (HBCD)	HBCD ban	HBCD-free	HBCD-free	HBCD-free	HBCD-free	HBCD-free	SDS and/or manufacturer declaration							Prevention of risk materials and impurities in recycling	Work stage 5–9
42	Construction products equipped with flame retardant (mixtures)	Technical fire protection, adhesive bonds or seals in interior spaces, PU installation adhesives: Firewall filler, fire protection coatings for cables, fire protection silicones, PU installation adhesives for insulating materials (EPS, XPS, PUR)	Chlorinated paraffins (cf. definition) and SVHC	Stockholm POP Convention and SVHC from the REACH candidate list as well as long-chain chlorinated paraffins	No use of PCBs (polychlorinated biphenyl) or CE marking			CPs < 0.1% and SVHC ≤ 0.1%	CPs < 0.1% and SVHC ≤ 0.1%	Technical data sheet and/or current SDS in accordance with 1907/2006/EC (substances that require declaration in SDS) and manufacturer declaration "No chlorinated paraffins and no SVHC > 0.1%"	All relevant components and construction products	Chlorinated paraffins POP Regulation REACH candidate list				Prevention of hazardous substances		Work stage 5–9
43	Construction products equipped with flame retardant (products)	Insulating materials for building services and wall coverings (fibreglass wallpapers, non-woven paint substrates, non-woven decorative fabrics, etc.)	Chlorinated paraffins (cf. definition), polybrominated biphenyls (PBB) and diphenyl ethers (PBDE) and SVHC	Stockholm POP Convention and SVHC from the REACH candidate list as well as long-chain chlorinated paraffins				CPs < 0.1% PBB < 0.1%, PBDE < 0.1%, and SVHC ≤ 0.1% Exemption: For construction material class B1, insulating materials with long-chain CP (LCCP) are tolerated	CPs ≤ 0.1% PBB < 0.1%, PBDE < 0.1%, and SVHC ≤ 0.1%	Technical data sheet and/or manufacturer declaration "No chlorinated paraffins, no polybrominated biphenyls, no polybrominated biphenyl ethers and no SVHC> 0.1%"	All relevant components and construction products	Chlorinated paraffins POP Regulation REACH candidate list				Prevention of hazardous substances	Prevention of hazardous substances	Work stage 5–9

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
44	Products made of Plastics (Factory)	External wall and roof sealing, wall coverings, windows, electrical cables: Plastic films, wall coverings, wallpaper, plastic windows, cable sheathing	SVHC phthalates (plasticisers) / hazardous substances	SVHC in the REACH candidate list (all); partially included in REACH Annex XIV				SVHC ≤ 0.1%	SVHC ≤ 0.1%	Technical data sheet and/or manufacturer declaration "No SVHC > 0.1%"	All relevant components and construction products	REACH candidate list				Prevention of hazardous substances	Prevention of hazardous substances	Work stage 5–9
45	Construction products (products) equipped with biocides and flame retardants: Wood preservatives, wood materials, insulating materials (Factory and building site)	Load-bearing wood structures, soft fibreboard, insulation incl. blown-in products and fills: Wood preservative preparations, wood materials, organic insulating materials (cellulose, fibreboard, wood shavings, sheep's wool, etc.)	Boron compounds as recipe components	SVHC in the REACH candidate list (all); partially included in REACH Annex XIV				Boron compounds ≤ 0.1%	Boron compounds ≤ 0.1%	Technical data sheet and/or manufacturer declaration "No boron compounds > 0.1%"	All relevant components and construction products						Prevention of hazardous substances	Work stage 5–9
46	PU system adhesive	PU construction adhesive for dry screed, hollow floors, dry construction boards	Solvents	REACH			Solvent-free (solvent content ≤ 0.5%)	Solvent-free (solvent content ≤ 0.5%)	Solvent-free) (solvent content ≤ 0.5%)	Technical data sheet and SDS	All relevant components and construction products							Work stage 5–9
47	Coated and uncoated wood-based materials: chipboard, blockboard, veneer panels, fiberboard	Interior doors made of wood-based materials, Room acoustic elements, room-in-room systems, Panel cladding on the wall and ceiling	Formaldehyde	emission values according to DIN EN 16516 or DIN EN 717-1 (with a factor of 2)		Formaldehyde ≤ 0.10 ppm (corresponds to 0.124 mg / m³)	Formaldehyde ≤ 0.10 ppm (corresponds to 0.124 mg / m³)	Formaldehyde ≤ 0.10 ppm (corresponds to 0.124 mg / m³)	Formaldehyde ≤ 0.08 ppm (corresponds to 0.096 mg / m³)									
48	Timber construction and prefabricated timber houses: Wood-based materials in structural timber construction (e.g. stiffening): chipboard, veneer panels, fibreboard	Bracing wooden panels on walls, floors and ceilings in wooden houses / wooden structures	Formaldehyde	emission values according to DIN EN 16516 or DIN EN 717-1 (with a factor of 2)		Formaldehyde ≤ 0.10 ppm (corresponds to 0.124 mg / m³)	Formaldehyde ≤ 0.10 ppm (corresponds to 0.124 mg / m³)	Formaldehyde ≤ 0.10 ppm (corresponds to 0.124 mg / m³)	Formaldehyde ≤ 0.08 ppm (corresponds to 0.096 mg / m³)									
49	Exterior and Interior walls, floor and ceiling coverings, Fillers and adhesives under wall and floor coverings Window / door / wall joints Building installations	Facade and wall cladding, insulation, lightweight and fire protection elements, sealing masses of wall and ceiling breakthroughs, ceiling coverings (such as fibreboard), tile adhesives, plastic coverings (e.g., asbestos-backed cushion-vinyl linings), cast and fillers, industrial screeds piping and insulation (heating and ventilation systems)	Asbestos fiber products	Regulation (EC) No. 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC	Asbestos free or CE marking	Asbestos free or CE marking	Asbestos free or CE marking	Asbestos free or CE marking	Asbestos free or CE marking	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate "no SVHC > 0.1%"	All relevant components and construction products	POP Regulation REACH candidate list	Prevention of fibers that are persistent by themselves or have degradation products those are persistent.				Prevention of risk materials and impurities in recycling	Service phase 3–9

No.	RELEVANT COMPONENTS/ CONSTRUCTION MATERIALS/ SURFACES	SCOPE	SUBSTANCES/ASPECTS CONSIDERED	REFERENCE STANDARD	QUALITY LEVEL 0	QUALITY LEVEL 1	QUALITY LEVEL 2	QUALITY LEVEL 3	QUALITY LEVEL 4	TYPE OF DOCUMENTATION	SCOPE OF APPLICATION AND VERIFICATION	NOTES REGARDING DEFINITIONS/EXPLANATIONS/ FOOTNOTES	FOCUS OF IMPACT OF THE SUBSTANCES/ASPECTS CONSIDERED OVER THE INDIVIDUAL STAGES IN THE LIFE OF A BUILDING (MODULES IN ACCORDANCE WITH DIN EN 15978)					APPLICATION
50	Artificial mineral fibers insulating materials for buildings and building installations	Heat and sound insulation of buildings Insulations of pipelines	Artificial mineral fibers	Regulation (EC) No. 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC	No use of Artificial mineral fibers ≤ 3 µm or CE marking	No use of Artificial mineral fibers ≤ 3 µm or CE marking	No use of Artificial mineral fibers ≤ 3 µm or CE marking	No use of Artificial mineral fibers ≤ 3 µm or CE marking	No use of Artificial mineral fibers ≤ 3 µm or CE marking	Technical data sheet and/or SDS and/or manufacturer declaration and/or test certificate "no SVHC > 0.1%"	All relevant components and construction products	POP Regulation	Prevention of fibers that are persistent by themselves or have degradation products that are persistent		Labour / work place protection		Prevention of risk materials and impurities in recycling	Service phase 5–9

APPENDIX 1 – Criteria matrix

Note: Color-coded rows (column "No."): In addition, the explanations in Chapter III Method have to be considered ("The following requirements of this criterion are listed below View, demonstrate and comply with materials / products / materials delivered to the site. ")

Note: Color-coded rows (column "No."): 47 and 48 to be considered as “optional” and serve for data sampling purposes i.e. no influence on the criterion evaluation in this release version. NOTE: for the projects claiming ESG Verification (compliance to the Taxonomy regulation) these cells are mandatory to fulfill

*** Use Classes**:

0 Internally installed wood, constantly dry, approach not possible due to wood-damaging insects or wood cross-section controllable (at least visible on three sides)

1 Internally installed wood, constantly dry, approach possible by insects that damage wood;

2 Timber that is not exposed to earth contact or direct weathering or leaching, temporary humidification possible

3 Wood not under roof, but without constant earth and / or water contact, accumulation of water in the wood - even spatially limited - to be expected

4 Wood exposed to continuous earth contact or constant humidification

Explanations and information regarding APPENDIX 1 (criteria matrix):

Legally valid proof (see General information: 1): Legally valid proof is considered to include a document signed ppa. or a clear statement in the manufacturer declaration that this was legally issued by a person with knowledge of the recipe.

Chlorinated paraffins:
The term "chlorinated paraffins" refers to substance mixtures that contain chlorinated alkanes with a chain lengths of 10-30 carbon atoms and a chlorination degree of 10% to 70% by mass (= SCCP (short-chain CP), MCCP (medium-chain CP) and LCCP (long-chain CP)).

POP Regulation and REACH candidate list:
Both the POP Regulation and the REACH candidate list currently regulate short-chain chlorinated paraffins. As a precaution, however, medium-chain and long-chain chlorinated paraffins are also relevant for consideration.

Approved substance in accordance with 528/2012/EC:
For products manufactured in the EU, it can be assumed that this requirement has been complied with due to the statutory regulations in place (no additional documentation is required here).

Biocidal Products Directive:
More information regarding the substances permitted within the Biocidal Products Directive can be found at: http://www.reach-clp-biozid-helpdesk.de/de/Biozide/Wirkstoffe/Genehmigte-Wirkstoffe/Genehmigte-Wirkstoffe.html

Documentation of emissions:
Certification (no more than 5 years old) by a laboratory accredited in accordance with ISO 17025 that the product or system complies with the AgBB criteria (except for sensory characteristics) on the basis of emissions testing in accordance with ISO 16000-9, prEN 16516 or EN 16402.

Hydrocarbon plasticiser (HC):
Hydrocarbon plasticisers are aliphatic hydrocarbons within a boiling point range of 200–400 degrees Celsius.

Note – coatings applied at the factory:
The VOC requirements in row 1 in the highest quality level (QL) can be fulfilled in the factory with coating materials of QL3 (<100 g VOC/l).

Note – use of recycled materials:
For products made from recycled plastics, proof that they do not contain organolead, organocadmium or organostannic compounds must be provided via a manufacturer declaration.

Information, explanations and footnotes for "Focus of impact of the substances/aspects considered over the individual stages in the life of a building":

- * "Halogenated refrigerants or propellants" in rows 13, 37, 38 and 39:
  Prevention of halogenated refrigerants or propellants, unless it has been proven that they and their degradation products do not accumulate in the environment or have persistent degradation products that can pollute (accumulate in) natural basins or have harmful effects there.

APPENDIX 2

(Table in Excel format is available under the internal area of DGNB website)

Criterion ENV1.2 - Local environmental impact

Project number:
Project name:
Auditor:

						Requirements		Submitted data sheets						
Building Component	Optional: Nr.	Product description and / or product type and / or function with, if necessary, (layer) assignment in the component	Product name	Manufacturer	Mounting place	Requirement according to criterion (the line number according to criteria matrix)	Achieved quality level DGNB	Proven attributes according to data sheets	Technical Data Sheet	Safety Data Sheet	Manufacturer' declaration /	Link / Reference to submitted data sheets	If required: remark / strike criterion / techn. Exception	If necessary: area shares / mass shares (plausible information actual building)
Example: Flooring	1	elastic floor covering	Linoleum Marboleum	Forbo	Ceiling covering 1st floor	7	4	SVHC ≤ 0.1%	x					
Example: Flooring	2	Adhesive for bonding (1)	L249DD	Thomsit	Ceiling covering 1st floor	8	4	VOC < 0.5%	x	x	x			250
Example: Flooring	3	Dust-binding primer on screed	R766	Thomsit	Ceiling covering 1st floor	8	4	EMICODE EC-1 plus	x	x	x			250
Example: Flooring	4	Screed cracking resin			Ceiling covering 1st floor	9	4	EMICODE EC-1 plus	x	x				

APPENDIX 3

Example letter "Confirmation by manufacturing companies"

"Dear Sir or Madam,

For the project:
The following coating materials/coating systems are planned to be used:

NO.	PRODUCT	DFT µM	VOC G/L	VOC MASS%	VOC G/M²
1					
2					
3					
Total					

Please supplement the VOC data in the units g/l, mass% and g/m² of coated surface with the specified dry film thickness (DFT) on the basis of the theoretical yield.

Thank you, and
kind regards

APPENDIX 4

Example letter "SVHC enquiry"

Regulation (EC) No. 1907/2006 (REACH Regulation), obligation to provide information in accordance with Art. 33

Dear Sir or Madam,

The European Chemicals Agency (ECHA) has published a list of substances of very high concern that meet the criteria of Art. 57 of the REACH Regulation mentioned above and that have been determined in accordance with the process described in Art. 59 of the regulation on its website (http://echa.europa.eu/chem_data/candidate_list_table_en.asp).

I request that you inform me/us, with reference to Art. 33(2) of the regulation mentioned above, of whether the product "XXXX" sold by you contains any of these substances of very high concern in proportions of more than 0.1%, and that you provide me/us with the information required for safe use of the product "XXXX".

In accordance with Art. 33 of the regulation mentioned above, you, as a supplier of "XXXX", are obliged to provide me, as a user, with this information within 45 days.

Thank you, and
kind regards

APPENDIX 5

Dealing with incorrect use (during material inspections on the construction site)

If, as part of these construction site inspections, it is determined that individual materials have been installed that are not in conformity with the intended quality level 3 or 4, their use must be prohibited in writing by the construction managers/property monitoring specialists. This notification of defects specifies the material, the affected component, the work that has been carried out, the reason for deviation and the areas constructed using the material that is not in conformity.
These deviations must be documented as follows in order to ensure that they do not prevent the achievement of objectives in accordance with quality level 3 or 4:

- Specification of the suitable material approved for use prior to commencement of the work in question (approval list with date),
- Written notification of defects by the construction managers/property monitoring specialists and notification that the work is free from defects by the company responsible for carrying out construction,
- Specification of the area where work was carried out using the material that is not in conformity; here, it must be proven that this amounts to < 5% of the area of the component (example: Flat roof as a warm roof, incorrect use of undercoat, area < 5% of the warm roof area) for which the material type in question is intended in the trade involved in carrying out the work (proof via building elements catalogue),
- The building owner is not subject to any penalties arising from harmful substances that permanently remain within the material such as heavy metals, plasticisers or solvents that form deposits on absorbent substrates (solvent seal on parquet) – proof via technical data and safety data sheet or SVHC documentation or manufacturer declaration, e.g. plasticisers
- The incorrect use does not prevent the achievement of objectives intended for the project in accordance with SOC1.2 indicator 1, Indoor air quality (degassing behaviour, ventilation programme for compensation, etc.)
- Logs of properly executed and regular material inspections (see above) on the construction site (cf. PRO2.1) are presented
- Construction managers/property monitoring specialists or, alternatively, the company responsible for carrying out construction provide legally valid confirmation (ppa.) that – with the exception of the single instance of incorrect use – work has been carried out exclusively with approved materials in accordance with the target quality level of this criterion

Please note: The DGNB expressly states that the DGNB documentation must correspond to the building constructed. Any discrepancies between the technical documentation and the DGNB documentation with regards to the materials used may therefore result in pecuniary losses, even for future owners of the buildings years later. As such, the constructions are tested for harmful substances, e.g. for DGNB inventory certification or as part of DD reviews, in order to prevent pecuniary losses as a result of refurbishment costs.

It is therefore recommended that the construction managers/property monitoring specialists obtain legally valid confirmation of the exclusive use of approved materials by the companies responsible for carrying out construction (e.g. via signature of the approval list).

ENV1.3

Sustainable resource extraction

Objective

Our objective is to promote the use of products in buildings and their external installations that are transparent with regard to their environmental and social impacts throughout the value chain and utilise raw material extraction and processing methods that comply with recognised environmental and social standards.

Benefits

Improved transparency helps to raise awareness regarding the sustainable resource extraction among all people involved in the value chain. This leads to the further expansion and wider dissemination of experience gained about sustainable and socio-ecologically acceptable raw material extraction and to therefore counteract environmental and social wrongs.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	12.2	Use of natural resources	12.1.a	Sustainable consumption
	15.2	Sustainable management of all forest types	15.3	Forests
Moderate	8.4	Global resource efficiency and decoupling of economic development	8.1	Resource conservation
			12.2	Sustainable production
	8.7	Ending child labour		
	12.5	Reducing and eliminating waste		
	12.6	Sustainability reporting		
Low			8.6	Global supply chains

Outlook

This criterion has been fundamentally revised in order to be able to reflect the modern reality of responsibility for raw materials extraction. In terms of evaluation, this criterion is designed to enable the DGNB to further expand the scope of analysis and to enable the evaluation of the quality levels to correspond to developments in the industry.

Share of total score

	SHARE[1]	WEIGHTING FACTOR
Office Education Residential Hotel	**2.4%**	**2**
Consumer market Department store		
Logistics Production		
Shopping centre	**2.3%**	**2**
Assembly buildings	**2.5%**	**2**

[1] Variable, building location related factors from the criterion ENV2.2 may influence the share of total score

EVALUATION

The use of products manufactured using raw materials that were extracted responsibly is evaluated positively if the products make up a relevant proportion of the structure, technical installations or external works in which they are used. The greater the proportion of raw materials extracted responsibly or replaced by secondary raw materials used in the building, the better the evaluation in this criterion. In this criterion, the maximum possible number of 100 points can be awarded across one or more indicators (classification of "max.100").

NO.	INDICATOR	POINTS
1	**Sustainably produced raw materials**	
1.1	**Corporate responsibility for resource extraction (quality level 1.1)**	**Max. 12**
	Products permanently installed inside the building or on its external surfaces which meet the requirements of quality level 1.1. and exceed the level of significance.	
	▪ A single product	+3
	▪ Two products from two different manufacturers	+6
	▪ Three products from three different manufacturers	+9
	▪ At least four products from at least four different manufacturers	12
1.2	**Certified sustainable resource extraction of a part of the value chain (quality level 1.2)**	**Max. 100**
	Method A – Quantitative assessment of entire material groups with moderate or minor relevance:	0-10
	Points:	
	▪ per material group	
	▪ between 0 and 10 points for between 0% and 80% of the reference value by means of linear interpolation	
	▪ can be added together for different material groups	
	Comment: for a material group permanently installed with estimated moderate or minor relevance with regard to the building and its external surfaces, the max. score can be achieved if the requirements of the quality level 1.2 have been met for at least 80% of the material specific reference value.	
	Method B – Quantitative assessment of entire material groups with high relevance:	0-25
	Points:	
	▪ Per material group	
	▪ between 0 and 25 points for between 0% and 80% of the reference value by means of linear interpolation	
	▪ can be added together for different material groups	
	Comment: for a material group permanently installed with estimated high relevance with regard to the building and its external surfaces, the max. score can be achieved if the requirements of the quality level 1.2 have been met for at least 80% of the material-specific reference value.	
	Method C – Qualitative assessment of products with reference to their use in the building or on its external surfaces: For products that are above the significance level and either cannot be assigned to any of the defined material groups or where there is no	Max. 80

quantitative assessment available for the entire material group in accordance with Method A or B and they meet the requirements of quality level 1.2.

Points:

- per certified product over the significance level
- assessment via application of the "Building relevance factors" (in accordance with Table 1) for the various applications
- can be added together for different material groups

Comment; Points in accordance with Method C cannot be awarded in addition to Methods A and B for the same products.

1.3 **Certified sustainable resource extraction (quality level 1.3)** **Max. 100**

Method A – **Quantitative assessment of entire material groups with moderate or minor relevance**: 0-30

Points:

- per material group
- between 0 and 30 points for between 0% and 80% of the reference value by means of linear interpolation
- can be added together for different material groups

Comment: for a material group permanently installed with estimated moderate or minor relevance with regard to the building and its external surfaces, the max. score can be achieved if the requirements of the quality level 1.3. have been met for at least 80% of the material-specific reference value.

Method B – Quantitative assessment of entire material groups with high relevance: 0-70

Points:

- per material group
- between 0 and 70 points for between 0% and 80% of the reference value by means of linear interpolation
- can be added together for different material groups

Comment: for a material group permanently installed with high relevance with regard to the building and its external surfaces, the max. score can be achieved if the requirements of the quality level 1.3 have been met for at least 80% of the material specific reference value.

Method C – Qualitative assessment of products with reference to their use in the building or on its external surfaces: Max. 100

For products that are above the significance level and either cannot be assigned to any of the defined material groups or there is no quantitative assessment available for the entire material group in accordance with Method A or B and they meet the requirements of quality level 1.3.

Points:

- per certified product over the significance level
- assessment via application of the "Building relevance factors" (in accordance with Table 1) for the various applications
- can be added together for different material groups

Comment: points in accordance with Method C cannot be awarded in addition to Methods A and B for the same products.

2 Secondary raw materials

2.1 Use of secondary raw materials with self-declaration (quality level 2.1) — Max. 100

Method A – Quantitative assessment of entire material groups with moderate or minor relevance — 0-10

Points:

- per material group and pro rata by the secondary raw material share
- between 0 and 10 points for between 0% and 80% of the reference value by means of linear interpolation
- can be added together for different material groups

Comment: for a material group permanently installed with estimated moderate or minor relevance with regard to the building and its external surfaces, the max. score can be achieved if the requirements of the quality level 2.1 have been met for at least 80% of the material specific reference value.

Method B – Quantitative assessment of entire material groups with high relevance: — 0-25

Points:

- per material group and pro rata by the secondary raw material share
- between 0 and 25 points for between 0% and 80% of the reference value by means of linear interpolation
- can be added together for different material groups

Comment: for a material group permanently installed with estimated high relevance with regard to the building and its external surfaces, the max. score can be achieved if the requirements of the quality level 2.1 have been met for at least 80% of the material specific reference value.

Method C – Qualitative assessment of products with reference to their use in the building or on its external surfaces: For products that are above the significance level and either cannot be assigned to any of the defined material groups or there is no quantitative assessment available for the entire material group in accordance with Method A or B and they meet the requirements of quality level 2.1. — Max. 80

Points:

- per certified product over the significance level
- assessment via application of the "Building relevance factors" (in accordance with Table 1) for the various applications
- can be added together for different material groups

Comment: points in accordance with Method C cannot be awarded in addition to Methods A and B for the same products.

2.2 Use of certified secondary raw materials with self-declaration (quality level 2.2) — Max. 100

Method A – Quantitative assessment of entire material groups with moderate or minor relevance: — 0-30

Points:

- Per material group and pro rata by the secondary raw material share
- between 0 and 30 points for between 0% and 80% of the reference value by means of linear interpolation

- can be added together for different material groups

Comment: for a material group permanently installed with estimated moderate or minor relevance with regard to the building and its external surfaces, the max. score can be achieved if the requirements of the quality level 2.2 have been met for at least 80% of the material specific reference value.

Method B – Quantitative assessment of entire material groups with high relevance: 0-70

Points:

- Per material group and pro rata by the secondary raw material share
- between 0 and 70 points for between 0% and 80% of the reference value by means of linear interpolation
- can be added together for different material groups

Comment: for a material group permanently installed with estimated high relevance with regard to the building and its external surfaces, the max. score can be achieved if the requirements of the quality level 2.2 have been met for at least 80% of the material specific reference value.

Method C – Qualitative assessment of products with reference to their use in the building or on its external surfaces: For products that are above the significance level and either cannot be assigned to any of the defined material groups or there is no quantitative assessment available for the entire material group in accordance with Method A or B and they meet the requirements of quality level 2.2. Max. 100

Points:

- per certified product over the significance level
- assessment via application of the "Building relevance factors" (in accordance with Table 1) for the various applications
- can be added together for different products

Comment: points in accordance with Method C cannot be awarded in addition to Methods A and B for the same products.

Re 1 and 2 **INNOVATION AREA**

Explanation: If it is not possible to represent sustainably extracted raw materials or secondary raw materials in accordance with the criterion and proof that all defined objectives have been achieved is available, these can, as an alternative, be credited in accordance with the evaluation scheme for indicators 1.2–1.3 and 2.1–2.2, subject to coordination and agreement with the DGNB.

Same as 1.2–1.3 and 2.1–2.2

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The use of responsibly extracted raw materials or secondary raw materials in the building can be used as key performance indicators (KPI) for communication.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Mass index for the (certified) sustainably produced raw materials that are installed in the building Note: The area (GFA) or volume (GV), for instance, can be selected as a unit of reference.	kg (certified) sustainably produced raw materials/unit of reference
KPI 2	Mass index for the (certified) secondary raw materials that are installed in the building Note: The area (GFA) or volume (GV), for instance, can be selected as a unit of reference.	kg (certified) secondary raw materials/ unit of reference

Synergies with DGNB system applications

- **DGNB BUILDINGS IN USE:** The requirements for construction products can be used as part of a procurement guideline for maintenance and interior finishing in criterion 9.2 "Procurement" from the scheme for buildings in use.
- **DGNB RENOVATED BUILDINGS:** This criterion corresponds to criterion ENV1.3 "Responsible procurement" from the scheme for renovated buildings.
- **DGNB INTERIORS:** This criterion corresponds closely to criterion ENV1.3 "Sustainable resource extraction" from the scheme for interiors.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

The intended effect of defining different quality levels is to make the market aware of the need to promote sustainable raw materials management. Quality levels and the associated required documentation throughout the value chain contribute to increased transparency. This enables measures for improving environmental and social standards to be identified and implemented as a fundamental cornerstone of efforts to improve resource efficiency.

The objective is therefore to encourage transparency and traceability in the origin, cultivation and harvest conditions or extraction conditions of raw materials and secondary raw materials as well as in the processing of these raw materials throughout the value chain by establishing binding standards – to provide guidance for consumer decisions as well.

Vision 2050: The benefits of sustainable resource extraction are understood by all participants in the value chain, and the resultant areas of action and required measures are recognised and effectively implemented throughout the value chain thanks to the improved transparency. The absolute depletion of natural resources as a whole is at a level that provides future generations with the same opportunities. An effective collection and recycling infrastructure supports extensive use of secondary materials, and new technologies make sure that construction materials are assembled and processed in a way that ensures ease of recycling.

II. Additional explanation

Standards support the communication of "invisible attributes" of raw materials and provide the companies involved with clear guidelines regarding various aspects of resource extraction. "Invisible attributes" may include social or environmental impacts, for instance, that cannot be detected by the processor and/or end user on the basis of the construction material, such as compliance with human rights laws in the extraction of raw materials or risk of groundwater contamination by chemicals used in resource extraction. Standards can convey complex information about the construction material to processors/end users credibly and reliably. They can help to harmonise and implement clear regulations and requirements on the international market.

Products used in the construction sector vary greatly in terms of their origin, production methods and processing methods. There are currently not many standards that reinforce comprehensive transparency and assurance of environmental and social standards. Many companies carry out their production operations in accordance with environmental management standards, comply with minimum social requirements or provide comprehensive reports regarding the essential sustainability aspects of their production processes as part of Corporate Social Responsibility (CSR) reports.

Designers should take the origin and extraction conditions of the raw materials used in construction products into account and actively discuss these with their building owners early in the selection process for construction materials and construction products.

III. Method

Introduction and overarching information
Usage of responsibly extracted and processed products, or products that include secondary raw materials and are installed in the building or on its external works, is evaluated on the basis of the three factors.

- The first factor is the substantive conformity of the objectives of the criterion with the measures implemented in terms of content, with regard to the product. This evaluation is performed using the definition of the five quality levels described.
- The second relevant factor to the evaluation is the quality of the documentation and/or the depth of implementation with regard to the product. This evaluation is performed using the distinction between quality level 1.1 (Products with proof of corporate responsibility), quality level 1.2 (Certified products – certificate records part of the value chain or part of the content requirements) and quality level 1.3 (Certified products), as well as between quality level 2.1 (Secondary raw materials with self-declaration) and quality level 2.2 (Secondary raw materials with certificate).
- The third factor that affects the evaluation is the quantity and relevance of the (raw) material with regard to the building. This evaluation is performed using the "Method for evaluating certified products in the building".

For products of quality level 1.1, a lump sum, of up to 12 points is awarded if the manufacturers of these products have high levels of corporate responsibility and these products are over the significance level.
For products of the other quality levels, three different methods are provided.

- **Method A** can be used if quantitative documentation is presented regarding the proportion of certified products from a material group in the building as a whole, if the relevance of the material in the building is minor or moderate. Depending on the quality level, up to 10 or 30 points can be awarded for this.
- **Method B** can be used if quantitative documentation is presented regarding the proportion of certified products from a material group in the building as a whole, if the relevance of the material in the building is high. Depending on the quality level, up to 25 or 70 points can be awarded for this.
- **Method C** can be used if qualitative documentation is presented regarding the products' installation location, their certificate or their declaration and this documentation indicates that the extent to which they have been used is above the significance level. Depending on the quality level, up to 80 or 100 points can be awarded here in total via predefined "Building relevance factors". Method C is suitable for products that cannot be assigned to any material group, or as a simplified method with no documentation of the total quantity of the material group and the proportion of certified products in this material group.

The proportion of certified products from one material group in the entire building can be assigned to different quality levels in accordance with available evidence.

In principle, all products permanently installed in the building or on its external installations that belong to: Structural building components in accordance with the table 1 “Building relevance factors" (detailed list according to Appendix 1, ECO1.1) or External works (detail description in “Outdoor facilities and open spaces”, Appendix 4) can be evaluated in this criterion. Products must exceed a significance level to enable indicator 1.1 and Method C to be applied. For the purposes of this criterion, products also include construction materials or assembled components or structural elements.

Country specific adaptation and exceptions
In the vast majority of countries high-quality documentation regarding responsible resource extraction and processing currently only exists for the small number of materials, certainly for wood/timber materials and natural stone. It is recommended when using wood products or wood materials, ensure that the high proportion of certified products are used in accordance with quality levels (QL) 1.2 or 1.3 the same is valid for the natural stone products. These two material groups (wood and natural stone) shell be always considered, recognised standards for different material groups can be seen in a document published separately by the DGNB: https://www.dgnb-system.de/en/system/label-recognition/index.php

If there is a country specific alternative certification system or a standard for material groups available e.g. alternatives for FSC certification but not yet published by the DGNB, a project specific solution can be made via DGNB system adaptation process. Ultimately, the organisation responsible for issuing standards can request recognition from the DGNB.

Minimum requirements

Compliance with minimum requirements should constitute an additional requirement for evaluation of products in the building or on its external works. As a general rule, it is only possible to positively evaluate construction products in - Structural building components and External works created using primary and secondary raw materials that, in their entirety (100% of the total mass):

- Have been cultivated, extracted or manufactured without the use of child labour or forced labour, and
- Have verifiably not been extracted or produced illegally.

Compliance with these minimum requirements does not need to be proven for construction products that only use primary raw materials extracted in EU countries and only use secondary raw materials produced in EU countries, as these are considered to be regulated sufficiently by EU law. Documentation of this in the form of an appropriate guarantee by the manufacturer that the minimum requirements have been complied with is required for quality level 1.1. For quality levels 1.2 and 1.3, full compliance with the minimum requirements must be guaranteed by the organisation responsible for issuing standards as part of product certification. For indicator 2 "Secondary raw materials", documentation for compliance with the minimum requirements from the time of the previous re-use of the material must be provided in full via a manufacturer declaration or a certificate.

Indicator 1: Sustainably produced raw materials

The use of raw materials certified as having been extracted responsibly in the building or on its external works and the use of raw materials in the building or on its external works for which the manufacturer has accepted and declared complete responsibility on the corporate level are evaluated positively in indicator 1 of this criterion. Please note: The use of secondary raw materials in the form of recycled material/products can be taken into account via indicator 2 "Secondary raw materials".

Indicator 1.1: Corporate responsibility for resource extraction (quality level 1.1)

The envisaged objective is for companies responsible for production to have information about the origin, extraction and processing of the (raw) materials used in their products and for them to contribute to ensuring increased transparency regarding environmental and social aspects throughout the value chain, and for active pressure by market participants to result in better environmental and social standards in extraction and production.

Products that have received an evaluation in accordance with quality level 1 have been produced in compliance with the minimum requirements. In addition, documentation is available demonstrating that the company/companies responsible for manufacturing the product assume(s) responsibility on the corporate level for responsible and transparent resource extraction and processing, and communicate(s) this appropriately for instance via CSR reports that show responsibility for the supply chain and suitably document the constituents of the products.

Responsibility on the corporate level is considered to mean that the manufacturer(s) assume(s) (shared) responsibility for compliance with environmental and social standards for the extraction and processing of the (raw) materials used by them, and undertake(s) to accept responsibility for corporate due diligence in accordance with the OECD Guidelines for Multinational Enterprises or other equivalent guidelines. The following principles and processes are at least incorporated into the corporate mission statement of the manufacturer(s) of the (raw) materials used in construction materials, products and components:

- Prevention of corruption and bribery,
- Prevention of negative environmental and social impacts resulting from (raw) materials or secondary materials (e.g. conflict minerals), used by the manufacturer(s) for their production processes,
- Prevention of human rights abuses.

In addition, the manufacturer must document the origin of the primary raw materials used in the products, specify all processing steps and indicate the locations (countries and regions) in which the processing steps were carried out. As proof of this, a raw materials list with documentation of origin and a description of the processing steps with locations must be presented in the form of a manufacturer declaration.

Method for evaluating certified products in accordance with quality level 1.1 in the building
If products are permanently installed in the building or on its external surfaces that are above the significance level, they can be incorporated into the evaluation as a lump sum of three points. It should be noted here that only one product per manufacturer is taken into account in the evaluation. Up to four different products from four different manufacturers can be taken into account in the evaluation. The significance level must be estimated via an assessment of the proportion of the production costs of the structure and its external works constituted by the product under evaluation. The significance level is equal to a 0.5% share of the material costs of the product under evaluation with reference to the overall costs from structural building components and external works. If the material costs cannot be determined, the use of typical cost parameters is permitted for determining the significance level. If no typical cost parameters are available either, cost parameters including installation and processing, etc. can be used as an alternative for determining the significance level.

Indicators 1.2 and 1.3: Certified sustainable resource extraction of a part of the value chain (quality level 1.2) and certified sustainable resource extraction (quality level 1.3)
Products that have received an evaluation in accordance with quality level 1.2 or 1.3 have been produced in compliance with the minimum requirements. In addition, the component/product used has a certificate for one of the standards recognised by the DGNB ("certification system" and "label" are synonyms for the purposes of this criterion) that goes beyond the statutory regulations regarding environmental protection and occupational safety and that, via the standard itself, at least ensures compliance with certain formal (systemic) requirements and content requirements at the product level. In order to narrow the scope of verification, the DGNB maintains and publishes a list in accordance with recognised standards: https://www.dgnb-system.de/en/system/label-recognition/index.php

If a standard is recognised by the DGNB, and compliance with the systemic requirements (separate document) and content requirements (in accordance with Appendix 1) for standards is thereby documented, the certificate of the standard can be used as part of evaluation of this criterion. If a standard is not yet recognised, either the organisation responsible for issuing standards can request recognition from the DGNB or a project-specific recognition can be obtained via the innovation area.

Requirements for standards relating to indicators 1.2 and 1.3
The differentiation in the sustainable resource extraction as part of a standard and its application in quality level 1.2 and quality level 1.3 relates to implementation of the requirements of a recognised standard for the certified products.

- If the standard allows the certification of just sub-elements of the elements of the value added chain which are defined in the sense of the criterion (focus on a sustainable resource extraction, e.g. just extraction of raw materials and not processing, or just processing of raw materials and not extraction), this application must be classified as "Certified sustainable resource extraction of a part of the value chain" (quality level 1.2). This classification can only be carried out if the standard of mapping the currently not considered elements of the value chain is determined in the future (The integration is already announced).

or

- If the standard allows the application of either just the environmental requirements or just the social requirements in the content requirements (see Appendix 1), classification into quality level 1.2 must also be carried out.

or

- If the standard allows a "mixture" of certified and non-certified raw materials, the organisation responsible for issuing standards must either carry out classification in accordance with quality level 1.2 or have a proportional evaluation based on the proportion of certified raw materials in the product carried out by the auditor. In case of doubt, the worst assumption must be used (worst-case scenario principle).

Only documented application of the environmental and social requirements defined as essential across all essential elements of the value chain enables classification into "Certified sustainable resource extraction" (quality level 1.3).

Systemic requirements for the purposes of the DGNB system (applies to quality levels 1.2 and 1.3):
The systemic requirements for certificates for sustainable resource extraction of the "Method for recognising standards as part of the DGNB system" are documented by the organisation responsible for issuing standards and fulfilled via the award criteria of the organisation (link to document to follow: "Recognition of standards as part of the DGNB system by the DGNB").

For classification of a standard into quality level 1.2, the following **content requirements** from the organisation responsible for issuing standards must be documented:

- **Content requirements for standards for the purposes of indicator 1.2 (quality level 1.2):**
  The standard clearly formulates environmental and/or social requirements in accordance with Appendix 1 in the form of sustainability goals that must be designated as essential, and the implementation of which must be demonstrated and communicated, for raw materials extraction and/or processing or production of construction materials, components or construction products within a specific group. The standard goes beyond statutory regulations.
  The requirements in the area of social issues are based on human rights conventions and the labour standards of the International Labour Organization (ILO), the ISEAL Assurance Code and the OECD Due Diligence Guidance. Relation to the aforementioned or equivalent standards must be demonstrated by the organisation responsible for issuing standards as part of the verification process for the label recognition process (https://www.dgnb-system.de/de/system/labelanerkennung/verfahren/)
  Compliance with the aforementioned systemic requirements and content requirements for a construction material, component or product must be documented by means of a product-specific and manufacturer-specific certificate identifying the scope and validity period. In addition, a declaration by the responsible manufacturer is required that confirms the continuous monitoring of compliance with the requirements or documents a "chain of custody certificate". The certificate regarding compliance with the requirements, the declaration of continuous monitoring and documentation of the installation of the construction material, component or product must be presented as documentation as part of the conformity check for a building certificate.

For classification of a standard into quality level 1.3, the following **content requirements** must be documented by the organisation responsible for issuing standards:

- **Content requirements for standards for the purposes of indicator 1.3 (quality level 1.3)**:
  The standard clearly formulates environmental **and** social requirements in accordance with Appendix 1 in the form of sustainability goals that must be designated as essential, and the implementation of which must be demonstrated and communicated, for raw materials extraction **and** processing or production of

construction materials, components or construction products within a specific group. The standard goes beyond statutory regulations.
The requirements in the area of social issues are based on human rights conventions and the labour standards of the International Labour Organization (ILO), the ISEAL Assurance Code and the OECD Due Diligence Guidance. Relation to the aforementioned or equivalent standards must be demonstrated by the organisation responsible for issuing standards as part of the verification process for the label recognition process.
Compliance with the aforementioned systemic requirements and content requirements for a construction material, component or product must be documented by means of a product-specific and manufacturer-specific certificate identifying the scope and validity period. In addition, continuous monitoring of compliance with the requirements must be documented (e.g. via a "chain of custody certificate"). The certificate regarding compliance with the requirements, continuous monitoring and documentation of the installation of the construction material, component or product must be presented as proof as part of conformity check for a building certificate.

Method for evaluating certified products in accordance with quality level 1.2 or 1.3 in the building
The evaluation can be carried out in accordance with three different methods.

Method A – Quantitative assessment of entire material groups with moderate or minor relevance:

- For a material group permanently installed with estimated moderate or minor relevance with regard to the building and its external surfaces, proof is available indicating that the requirements of quality level 1.3 have been met for at least 80% of the material-specific reference value. Assessment of the relevance of the material group in the building must be carried out on the basis of the costs. For this process, the costs of the material group with reference to overall costs from structural components and external works must be determined or plausibly estimated. If the proportion of the costs represented by the material group is less than 5% of the overall costs (total of structural components and external works), the relevance in the building must be classified as moderate to minor (Method A).

The material groups permitted for the evaluation in accordance with Method A are (with the specific reference values to be used in brackets):

- Wood and wood materials (volume)
- Natural stone (mass)
- Concrete (volume)
- Metals (mass)
- Cork (mass)
- Glass (mass)

This method can be applied for each material group. It involves linear evaluation of the proportion of certified products in the total quantity/total volume of the reference value of between 0% and 80%. The full number of evaluation points are awarded at an 80% proportion of certified products. This evaluation can be applied for the six material groups listed above. The points achieved for each material group can be added together, up to a maximum of 80 evaluation points.

Method B – Quantitative assessment of entire material groups with high relevance:

- For a material group permanently installed with estimated high relevance with regard to the building and its external surfaces, proof is available indicating that the requirements of quality level 1.3 have been met for at least 80% of the material-specific reference value. Assessment of the relevance of the material group in the

building must be carried out on the basis of the costs. For this process, the costs of the material group with reference to overall costs from building structural components and external works must be determined or plausibly estimated. If the proportion of the costs represented by the material group is greater than or equal to than 5% of the overall costs (structural components and external works), the relevance in the building must be classified as high.

The material groups permitted for the evaluation in accordance with Method A are (with the specific reference values to be used in brackets):

- Wood and wood materials (volume)
- Natural stone (mass)
- Concrete (volume)
- Metals (mass)
- Cork (mass)
- Glass (mass)

This method can be applied for each material group. It involves linear evaluation of the proportion of certified products in the total quantity/total volume of the reference value of between 0% and 80%. The full number of evaluation points are awarded at an 80% proportion of certified products. This evaluation can be applied for the six material groups listed above. The points achieved for each material group can be added together, up to a maximum of 100 evaluation points.

Method C – Qualitative assessment of products with reference to their use in the building or on its external surfaces:

- For products that are above the significance level and either cannot be assigned to any of the defined material groups or lack any quantitative assessment of their total quantity for their entire material group in accordance with Method A or B, proof that they meet the requirements of quality level 1.3 is available.

This method can be applied for each certified product that is above the significance level. The significance level must be estimated via an assessment of the proportion of the production costs of the structure and its external works constituted by the product under evaluation. The significance level is equal to a 0.5% share of the material costs of the product under evaluation with reference to the overall costs from building structural components and external works. If the material costs cannot be determined, the use of typical cost parameters is permitted for determining the significance level. If no typical cost parameters are available either, cost parameters including installation and processing, etc. can be used as an alternative for determining the significance level.

The points can be determined in accordance with the "Building relevance factors" specified in Table 1 for the various applications in the building. In each case, the proportion of the certified product in the selected reference application in the building is not relevant. The points can be added together for different products and material groups. Products that have already been evaluated in accordance with Method A or B are excluded from this (duplication of assessments is not permitted).

Table 1: Points per product in its application in the building – "Building relevance factors"

COMPONENTS	POINTS FOR PRODUCTS IN QUALITY LEVELS 1.3 OR 2.2	POINTS FOR PRODUCTS IN QUALITY LEVELS 1.2 OR 2.1
External walls		
Non-load-bearing or prefabricated	5	2
Cladding units and internal linings (of external walls)	3	1
External doors and windows	3	1
Internal walls		
Non-load-bearing or prefabricated	8	3
Internal linings (of internal walls)	8	3
Internal doors and windows	7	3
Floors and ceilings		
Floorings	12	5
Ceiling linings	10	4
Roofs		
Roof coverings and roof linings	3	1
Load-bearing structures		
Load-bearing external walls	8	3
External columns	2	1
Load-bearing internal walls	6	2
Internal columns	2	1
Floor structures	8	3
Roof structures	4	2
Foundations		
Shallow or deep foundations	2	1
Subsoil and base slabs	2	1
Floorings	2	1
External works		
Ground surfaces, hard surfaces, external construction works	5	2

Indicator 2: Secondary raw materials

Recycling is an alternative option for reducing extraction of primary raw materials and the associated impacts. For this reason, the use of post-consumer secondary raw materials and pre-consumer secondary raw materials (which should demonstrably come from external sources; pre-consumer in-house recycling cannot be taken into account) in the building is also evaluated positively. Demonstrably recycled materials used in the building can be incorporated into the evaluation via two quality levels. Quality level 2.1 enables points to be awarded for secondary raw materials installed in the building or on its external works that confirm their secondary raw material share in the product with a self-declaration. Quality level 2.2 enables points to be awarded for secondary raw materials installed in the building or on its external works that confirm their secondary raw material share in the product with a certificate.

Indicator 2.1: Use of secondary raw materials with self-declaration (quality level 2.1)

Products that have received an evaluation in accordance with quality level 2.1 have been produced in compliance with the minimum requirements. In addition, the construction material, product or component used has a self-declaration by the manufacturer that the construction material, product or component contains secondary raw materials, and this declaration specifies the associated proportions by mass (analogous to content requirements in Appendix 2). The self-declaration/manufacturer declaration can use manufacturer-specific secondary raw material shares or secondary raw material shares typical of the industry as a basis for the secondary raw material share.

Evaluation of secondary raw materials with self-declaration in the building

Points can be awarded for raw materials with a secondary raw material share installed in the building or on its external works in accordance with the method applied for quality level 1.2. However, only the actual secondary raw material share in the installed product is relevant for the evaluation, via proportional awarding of the points for the indicator. As an evidence a self-declaration or manufacturer's declaration, either with the manufacturer-specific or the sector-typical proportion of secondary raw materials, must be submitted. If an industry-specific proportion of the secondary raw materials is specified, the relevant declaration or confirmation from the manufacturer is needed, where the method of production - and thus the proportion of secondary raw materials – is clarified.

Indicator 2.2: Use of certified secondary raw materials (quality level 2.2)

Construction materials, products and components that have received an evaluation in accordance with quality level 2.2 have been produced in compliance with the minimum requirements. In addition, the construction material, product or component used has a certificate for a recognised standard ("certification system" and "label" are synonyms for the purposes of this criterion) that at least ensures compliance with certain formal (systemic) requirements and content requirements. In order to narrow the scope of verification, the DGNB maintains a list in accordance with recognised standards.
If a standard is already recognised by the DGNB, and compliance with the systemic requirements (separate document) and content requirements (in accordance with Appendix 2) for standards is thereby documented, the certificate of the standard can be used as part of evaluation of this criterion. If a standard is not yet recognised, either the organisation responsible for issuing standards can request recognition from the DGNB or a project-specific recognition can be obtained via the innovation area.

Evaluation of certified secondary raw materials in the building

Points can be awarded for raw materials with a secondary raw material share installed in the building or on its external works in accordance with the method applied for quality level 1.3, by providing documentation of a recognised standard <u>and</u> documentation of the relevance of the materials in the building. However, only the actual secondary raw material share in the installed construction material, product or component is relevant for the evaluation, via proportional awarding of the points for the indicator. The certificate must be produced, detailing the secondary raw material share.

Appendix 1: Content requirements for organisations responsible for issuing standards for recognition by the DGNB for quality levels 1.2 and 1.3

Recognition of standards for the purposes of the criterion by the DGNB
If compliance with the systemic requirements and content requirements for standards is documented, a certificate of the standard can be referenced as part of the evaluation. If the standard is already recognised by the DGNB, this can be taken from a document published separately by the DGNB: https://www.dgnb-system.de/en/system/label-recognition/index.php . If a standard is not yet recognised, the organisation responsible for issuing standards can request recognition from the DGNB.

Content requirements for standards:
The standard clearly formulates **environmental and social requirements** in the form of **sustainability goals** that are essential/significant for raw materials extraction and the processing or manufacturing of construction materials within a specific group and that demonstrate and communicate the implementation of the same. The standard goes beyond statutory regulations.

Definition of "Environmental requirements"
The objective is to reduce negative environmental impacts in the area of raw materials extraction and processing. Compliance with the following **environmental** sustainability goals that are relevant to specific raw materials and are essential for the extraction and processing of the raw materials groups in question must be proven via the standard. The assignment of which environmental objectives are essential for which individual raw materials group is listed in a separate document and is available from the DGNB office.

1. Protection and preservation of biodiversity
2. Ensuring the continued existence and protection of ecosystems (habitat diversity) – natural environments should be returned to a state that is at least equivalent to their original state. The prohibition of deterioration applies here.
3. Preservation of protective functions of ecosystems (flood protection, potable water, avalanches, etc.)
4. Preservation of soil and landscapes by reducing land use
5. Preservation of soil quality by preventing biological, chemical and physical land degradation (e.g. soil compaction, soil erosion, soil contamination due to the use of chemicals that are harmful to the environment and health or dangerous (substances of very high concern in accordance with REACH))
6. Preservation of the natural water cycle
7. Reduction of water consumption and prevention of impacts on surface water levels and/or groundwater levels and their quality
8. Prevention of water pollution (e.g. prevention of impacts on water quality due to waste water)
9. Prevention of waste, particularly toxic waste
10. Preservation of air quality by preventing harmful emissions
11. Reduction of environmental impacts due to transportation (e.g. by using local/regional sources of raw materials).

Definition of "Social requirements"
The objective is to reduce negative social impacts resulting from the extraction and processing of raw materials. Compliance with the relevant **social sustainability goals** that are essential for raw materials extraction and the processing and production of products in a specific group must be proven via the standard. The assignment of which social objectives are essential for which individual raw materials group is listed in a separate document and is available from the DGNB office.

1. Ban on child labour and forced labour in accordance with ILO Conventions (ILO = International Labour Organisation) (29, 105, 138 and 182)
2. Compliance with fundamental ILO core labour standards and occupational safety and health measures

(prevention of industrial accidents/protecting workers in hazardous conditions) across the entire supply/value chain

3. Compliance with labour laws (e.g. ensuring the existence of a written contract of employment in accordance with statutory requirements), also applies for subcontractors
4. Compliance with the right to freedom of association, protection of the right of association and compliance with the right to collective bargaining in accordance with ILO Conventions 87 and 98
5. Equal remuneration and non-discrimination in the workplace in accordance with ILO Conventions 100 and 111
6. Implementation of "ethical business" (such as preventing corruption, implementing fair business practices and compliance with laws)
7. Preservation of cultural values and compliance with the rights of indigenous peoples and the local population. Prevention of resource conflicts and threats to the livelihood of the local population due to possible negative impacts of raw materials extraction, processing or manufacturing of products (expropriation and dispossession of land, forced resettlement or negative impacts on food security)

The requirements in the area of social issues are based on human rights conventions and the labour standards of the International Labour Organization (ILO), the ISEAL Assurance Code and the OECD Due Diligence Guidance. Relation to the aforementioned or equivalent standards must be demonstrated as part of the verification process. Compliance with the aforementioned systemic requirements and content requirements must be documented by means of a product-specific and manufacturer-specific certificate identifying the scope and validity period.

Appendix 2: Content requirements for recognition by the DGNB for quality levels 2.1 and 2.2

Recognition of standards for the purposes of the criterion by the DGNB
If compliance with the systemic requirements and content requirements for standards is documented, a certificate of the standard can be referenced as part of the evaluation in accordance with quality level 2.2. If the standard is already recognised by the DGNB, this can be taken from a document published separately by the DGNB: https://www.dgnb-system.de/en/system/label-recognition/index.php. If a standard is not yet recognised, the organisation responsible for issuing standards can request recognition from the DGNB.

The systemic requirements and content requirements for products with secondary raw material shares are defined as follows and documented by the organisation responsible for issuing standards:

- **Systemic requirements for the purposes of the DGNB system (applies to quality level 2.2)**:
  The systemic requirements for certificates for secondary raw materials from the "Method for recognition of standards as part of the DGNB system" have been met: ("Recognition of standards as part of the DGNB system by the DGNB" - https://www.dgnb-system.de/de/system/labelanerkennung/verfahren/).

For classification of a standard to quality level 2.2, the following content requirements must be documented:

- **Content requirements for standards for the purposes of indicator 2.2 (quality level 2.2)**:
  The standard documents the use of secondary raw materials in manufacturing construction materials, components or construction products and their proportions in the products.
  Compliance with the aforementioned systemic requirements and content requirements for a construction material, component or product must be documented by means of a product-specific and manufacturer-specific certificate identifying the scope and validity period. In addition, continuous monitoring of compliance with the requirements must be documented (e.g. via a "chain of custody certificate"). The certificate regarding compliance with the requirements, continuous monitoring and documentation of the installation of the construction material, component or product must be presented as proof as part of conformity check for a building certificate.

Appendix 3: Raw material-specific requirements at the building level

1. Use of wood and wood materials

A minimum requirement for awarding of quality level 1.2 or 1.3 for installed wood and wood products is, above all, that wood harvested via uncontrolled extraction in tropical, subtropical and boreal climate zones cannot be used. The use of tropical, subtropical or boreal woods that lack certification constitutes a failure to meet this minimum standard. In this case, no points will be awarded.

In general, the supplier of wood and wood-based materials has to prove the regulated, sustainable management of the forest of origin by submitting a "Chain of Custody" certificate. Only certificates that prove conformity with the labels * recognized by the DGNB are accepted as evidence. The supplier must also declare the country of origin and the type of wood. Alternatively, product certification in accordance with the FSC or PEFC labels possible.

2. Use of natural stone

A fundamental requirement for an evaluation in accordance with quality level 1.1, 1.2 or 1.3 of a natural stone is that the product was manufactured without child labour or forced labour and an illegal raw material extraction / production is excluded. If natural stones from EU countries are used, the minimum and content requirements are assumed to be implemented. A manufacturer's declaration must be submitted as evidence, confirming compliance with the minimum requirements and stating that all places of origin and processing must be in EU countries. The use of natural stone from countries within the EU is not the subject to any restrictions. The CE marking of the product can be used as a proof of this. Natural stones with this evidence can be assessed in quality level 1.2. For the evaluation of natural stones from non-EU countries according to indicator 1, it must be proven that the requirements of ILO Convention 182 are met and that independent third-party inspections have taken place.

*The standards recognized by the DGNB are published and updated online

Appendix 4: Outdoor facilities and open spaces

"External works" comprise Construction services and supplies for the construction of outdoor facilities of buildings and open spaces, which are self-reliant and independent of the structures, with the associated structural installations, constructions or technical installations. This also includes built-in components permanently attached to building structures that serve the special purpose as well as overarching measures.

EXTERNAL WORKS (MAIN AND SUB-LEVELS)	CONTENT
Earthworks	Surface and ground works, earthworks, excavations, dams, incisions, ramparts, slope stabilisers
Manufacturing	Soil removal and soil protection including topsoil and soil application; excavation of excavations and excavations including working areas and embankments; warehousing, soil delivery and soil removal; fillings and backfills;
Enclosure	Laying and securing of excavation pits, construction units, dams, ramparts and incisions (e.g. slot, pile, sheet pile, girder screed, injection and shotcrete securing) including anchorages, bracings and embankments
Drainage	Removal of ground and layer water during construction
Excavation	Underground disruption including support and locking
Foundation, substructure	foundation and substructure measures of outdoor facilities and open spaces including the related earthworks and cleanliness layers, if not included in the earthworks
Soil improvements	Soil exchange, compaction, pressing in, anchoring, support measures, soil loosening, laying of geotextiles
Foundations and floor slabs	Single foundations, strip foundations, foundation, floor and floor slabs
Foundation coverings	Coverings on base, floor and foundation slabs (e.g. screeds, sealing, insulating, protective and wear layers)
Seals and lining	Construction layers below the base, floor and foundation slab, waterproofing and linings of the foundation, including insulation, as well as filter, release, clean and protective layers
Drainage	Pipes, shafts, packings, sumps, deep drainage, surface drainage

Superstructure, surface layers	Superstructure and surface layers of outdoor facilities and open spaces; Superstructure and surface layers with or without binders on paved surfaces, including bedding materials, joint fillings, markings and borders (e.g. ribs, edging stones)
Pathways	Superstructure and surface layers of surfaces for pedestrian and bicycle traffic
Roads	Superstructure and surface layers of areas for light and heavy traffic as well as pedestrian zones with delivery traffic
Squares, courtyards, terraces	Superstructure and surface layers of courtyards, courtyards, terraces and seats
Parking	Superstructure and surface layers of surfaces for stationary traffic
Sports field surfaces	Superstructure and surface layers of sports fields
Railway tracks	Tracks, including switches and sleepers
Airfield surfaces	Superstructure and surface layers for example of helicopter landing pads,

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators. In addition to the documents listed below, the instructions specific to raw materials specified in Appendix 3 must also be taken into account. The tool provided by the DGNB must be used for the verification.

Indicator 1: Sustainably produced raw materials
Minimum requirements:

- Documentation by the manufacturer/processor regarding the avoidance of illegal harvesting of raw materials
- Documentation by the manufacturer/processor regarding the exclusion of child labour and forced labour (product name, issuer of the document, date of issue and signature, conformity with ILO Convention 182)
- If necessary, documentation by the manufacturer/processor regarding material procurement and/or production in Europe
- As long as compliance with the minimum requirements can be proven by submitting a label, separate documentation need not be provided

Indicator 1.1: Documentation for quality level 1.1

- Excerpts from the risk management used regarding the relevant raw material, together with results reports, analyses, measures, documentation of origin and any resulting consequences for the manufacturer (for each raw material under consideration)
- Excerpt from corporate guidelines (highlighting relevant passages, e.g. the CSR report regarding the required principles and processes of the company together with a description of the relevance of the raw material)
- Assessment/estimate of the extent to which the significance level has been exceeded

Indicators 1.2 and 1.3: Documentation for quality levels 1.2 and 1.3

- If Method A or B is applied: Quantification of the raw material used (e.g. via building elements catalogue for the life cycle assessment or via the conventional method on the basis of the tenders)
- Specification of the type of the relevant raw materials from the same raw materials group installed (e.g. wood, wood products and/or wood materials)
- Proof that the products used are certified with a standard (label) recognised by the DGNB
- Delivery note or invoice from the supplier (specifying the CoC certification number and the name of the project under certification). The delivery document must indicate the certification status of the item being documented, if required by the applicable standard (e.g. FSC, PEFC or CSC Silver/Gold certification)
- Drop shipments: if the products are sourced via a dealer who simply passes on the original packaging, this dealer must present the delivery note/invoice from their supplier, which must specify its CoC certification number, the certification status of the item being documented, the name of the dealer and the certified project

- If Method C is applied: assessment/estimate of the extent to which the significance level has been exceeded

Please note: Implementation of the requirement for certified raw materials/products/components is only worthwhile if this was already formulated in the tender. Delivery documents with the corresponding documentation are only possible if the processing company is made aware of the required certification early enough (if possible, when the order is received). It is generally not possible to issue the required documents retrospectively.

Indicator 2.1: Documentation for quality level 2.1

- Specification of the type of relevant secondary raw materials installed
- If Method A or B is applied: quantification of the secondary raw material used (e.g. via building elements catalogue for the life cycle assessment or via the conventional method on the basis of the tenders)
- If Method C is applied: assessment/estimate of the extent to which the significance level has been exceeded
- Proof that a self-declaration regarding the secondary raw material share is available for the products used

Indicator 2.2: Documentation for quality level 2.2

- Specification of the type of relevant secondary raw materials installed
- If Method A or B is applied: quantification of the secondary raw material used (e.g. via building elements catalogue for the life cycle assessment or via the conventional method on the basis of the tenders)
- If Method C is applied: assessment/estimate of the extent to which the significance level has been exceeded
- Proof that the products used are certified with a standard (label) recognised by the DGNB
- Delivery note or invoice from the supplier (specifying the CoC certification number and the name of the project under certification). The delivery document must indicate the certification status of the item being documented, if required by the applicable standard (e.g. FSC or PEFC certification)
- Drop shipments: if the products are sourced via a dealer who simply passes on the original packaging, this dealer must present the delivery note/invoice from their supplier, which must specify its CoC certification number, the certification status of the item being documented, the name of the dealer and the certified project

Please note: Implementation of the requirement for certified secondary raw materials/products/components is only worthwhile if this was already formulated in the tender. Delivery documents with the corresponding documentation are only possible if the processing company is made aware of the required certification early enough (if possible, when the order is received). It is generally not possible to issue the required documents retrospectively.

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
all	General: scheme “Assembly buildings” has been added	16.09.2021
all	Evaluation: clarification on point interpolation e.g. 0-10 instead of +10	16.09.2021
166	Method: clarification on evaluation of secondary raw materials with self-declaration	16.09.2021
171	Appendix 3: clarification on raw material-specific requirements at the building level	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org
- International Labour Organisation (ILO):
  - Convention 29 – Forced Labour, 1930
  - Convention 98 – Right to Organise and Collective Bargaining Convention, 1949
  - Convention 105 – Abolition of Forced Labour, 1957
  - Convention 138 – Minimum Age Convention, 1973
  - Convention 182 – Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour, 1999
- OECD Guidelines for Multinational Enterprises

ENV2.2

Potable water demand and waste water volume

Objective

Our objective is to maintain the natural water cycle and reduce potable water demand by recycling waste water and using local resources.

Benefits

Reduction of potable water and waste water demand reduces running costs. In addition, a high level of waste water recycling and the use of local resources (wells, rainwater) helps achieve independence from price fluctuations and availability.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Moderate	6.3	Improvement of water quality		
	6.4	Efficient use and sustainable extraction of water		
Low	6.5	Implementation of integrated water resource management	6.2	Potable water and sanitation

Outlook

The issue of potable water will continue to increase in importance, particularly in an international context. The DGNB will monitor developments and update the criterion accordingly. In addition, a quality assessment can be added in the long term, as contamination of potable water with nitrates will increase in relevance.

Share of total score

	SHARE	WEIGHTING FACTOR[1]
Office Education Residential Hotel Consumer market Department stores Logistics Production	2.4%	2
Shopping centre	2.3%	2
Assembly buildings	2.5%	2

[1] Share of the total score and weighting factor may vary depending on the country specific Water Stress Indicator (WSI), detailed description in Appendix 1

EVALUATION

The quantitatively determined water use value that represents the balance of potable water and waste water can be used for evaluation. In addition, maintenance of the natural water cycle and reduction of potable water demand by recycling waste water and using local resources is taken into account using the indicators "Watering and retention" and "Integration into the district infrastructure". In this criterion, the maximum possible number of 100 points can be achieved.

NO.	INDICATOR	POINTS
1	**Potable water demand and waste water volume**	
1.1	**Water use value**	**Max. 90**
	■ Dynamic limit value ≤ water use value	10
	■ Dynamic reference value ≥ water use value	45
	■ Dynamic target value ≥ water use value	90
Re 1	**CIRCULAR ECONOMY** Explanation: The use of rainwater or grey water is incorporated into the assessment of the water use value. The potable water saved and the reduced waste water are recorded in the assessment of the water parameter and are incorporated into the life cycle assessment evaluation. The contribution to the circular economy is thereby fully implemented in the criterion.	
2	**External works**	
2.1	**Watering and retention**	**Max. 5**
	■ Watering the outdoor facilities with potable water is not foreseen.	+2.5
	■ The outdoor facilities include rainwater retention devices.	+2.5
3	**Integration into the district infrastructure**	
3.1	**Level of integration** The rainwater and waste water disposal method is geared towards the existing infrastructure in the surrounding district and uses all available opportunities for separation, reduction, etc.	**5**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPIs) include using the water use value determined in indicator 1 for communication. In addition, the water demand of the users can be used for communication in accordance with the "Level(s) – Common EU framework of core environmental indicators" (more detailed description is under the [T&D_02]).

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Water use value and WSI in accordance with the DGNB; corresponds to Level(s) indicator 3.1 "Use stage water consumption" incl. water exploitation index (WEI+) Note 1: This indicator should be communicated differentiated by "Sanitary water consumption", "Water consumption by devices that need water" and "Total water consumption", and should also relate to the number of people	[m³/a]
KPI 2	GRI Disclosure 303-1 (an international sustainability reporting organization) "Total water withdrawal by source" Note 1: The total water demand, indicating the source (groundwater, rainwater, waste water of another organisation, communal water supply)	[m³/a]

Synergies with DGNB system applications

- **DGNB BUILDINGS IN USE:** High synergies with criterion ENV9.1 from the scheme for buildings in use : The demand values for water from the water parameter calculation can be used for the operation. This enables consumption values to be checked and helps users to optimise operation.
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion ENV2.2 (calculation of indicator 1) from the scheme for renovated buildings.
- **DGNB DISTRICT:** The results determined for use of rainwater or grey water in the buildings, details of watering of the external works and information regarding integration into the district have high synergies with criterion ENV2.2 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Reduction of potable water demand reduces running costs. In addition, a high level of waste water recycling and the use of local resources (wells, rainwater) helps achieve independence from price fluctuations and availability. All these and many other aspects may vary in severity depending on the geographical location. During the country specific adaptation process of the system, the share and weight of this criterion may be adjusted according to the WSI listed in the Appendix 1 of this document.

II. Additional explanation

In order to ensure supply of high-quality potable water, water is withdrawn from the natural cycles on a daily basis, subjected to cost-intensive preparation and then used. The resulting waste water must then be purified of harmful substances and contamination before it is returned to the natural water cycle. The objective of sustainable construction is therefore to reduce potable water demand and waste water volume in order to disturb the natural water cycle as little as possible.

These requirements are tested and evaluated on the basis of established assumptions regarding user behaviour and planned use of grey water and rainwater. Equally important is the issue of how the water is drained and treated within the building. A holistic approach that also takes design aspects into account enables conditions to be established that are crucial for achieving the objectives specified in the DGNB criterion.

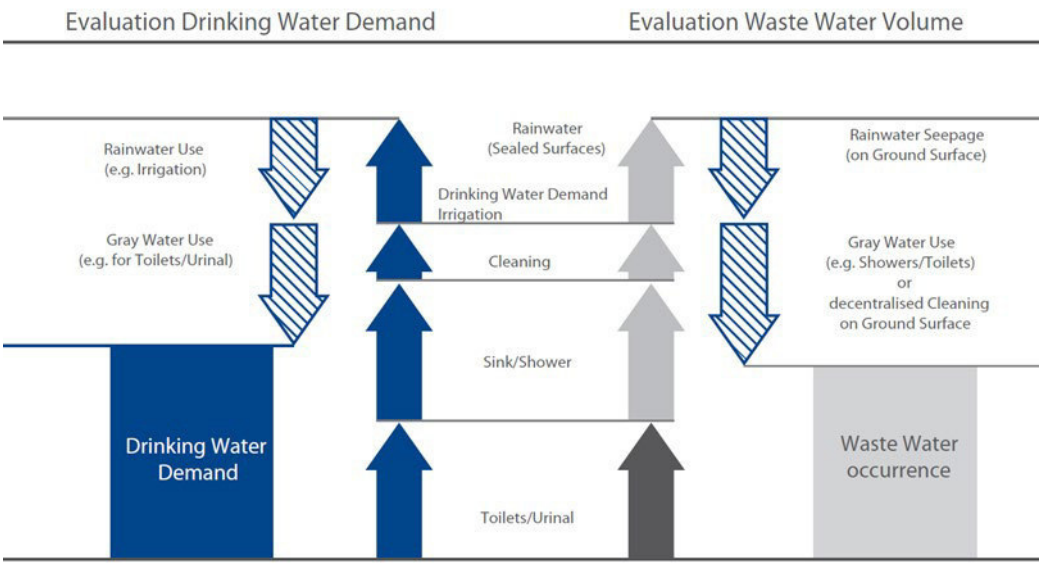
III. Method

Adding together the determined potable water demand and waste water volume results in the "water use value". This represents a simple value for evaluating the use of water in the building. The water expended during construction is ignored. Established assumptions regarding user behaviour and actually determined parameters are incorporated into the evaluation.

System limits

Measures that can be affected by the designer are primarily considered for evaluation of the potable water demand and waste water volume. This does not include demand for potable water for drinking or, where applicable, food preparation, for example. A selective analysis of individual criteria is not permitted, as this conflicts with a holistic evaluation. This means that elements such as decentralised waste water treatment plants and planned use of rainwater, river water or waste water may only be incorporated into the assessment if they are also taken into consideration in the other relevant criteria (particularly the building-related life cycle costs).
In general, consumption by users is the deciding factor for the water demand, meaning that water-saving technology is particularly worthwhile for reducing water consumption. In contrast, cleaning has only a minor impact, while the impact of the total area used for plants and rainwater management must be evaluated differently depending on the local circumstances.

Figure 1: System limits of the water use value calculation



Benchmarks

Depending on the number of users, roof surface area and amount of plants, a building's annual demand for potable water and the amount of waste water produced can vary greatly. For this reason, a dynamic limit value is determined using the individual conditions of the building. Usage-specific limit values are determined according to the formulas in indicator 1, whereby neither grey nor rain or river water use or decentralized wastewater treatment is taken into account.

Indicator 1.1: Water use value

The water use value (WUV) is calculated as follows:

$$\mathbf{W_{UV} = (WD_U + WW_U) + (WW_{RW}) + (WD_{SPA} + WW_{SPA})} \quad \mathbf{(1)}$$

where

- W_{UV} Water use value in [m³/a]
- WD_U Employee water demand in [m³/a]
- WW_U Waste water by users in [m³/a]
- WW_{RW} Portion of rainwater diverted to the drain system in [m³/a]
- WD_{SPA} Drinking water requirement for spa area in [m³/a]
- WW_{SPA} Waste water for spa area in [m³/a]

IV. Usage-specific description

Office
Education
Residential (up to "Specifications for user behaviour" and “Presence days”)
Logistics
Production (up to "Specifications for user behaviour")

Indicator 1: Potable water demand and waste water volume – by users

The water demand of employees (WD_U) is determined from the total of the potable water demand of installations under the established assumptions regarding user behaviour. Use of rainwater, river water or grey water that can replace the use of potable water is subtracted from the water demand:

$$\mathbf{W_{DU} = \sum_{i=1}^{n} wd_I - N_{RW} - N_{GW}} \qquad \textbf{(2)}$$

where

- WD_U Water demand by users/residents/employees in [m³/a]
- wd_I Specific water demand of installations in the building in [m³/a]
- N_{RW} Amount of rainwater or river water used, e.g. to flush toilets, in [m³/a]
- N_{GW} Amount of grey water used, e.g. to flush toilets, in [m³/a]

The amount of rainwater, river water and grey water used can be taken from the profitability calculation for use of rainwater, river water and grey water.
The specific water demand of installations (wd_I) is determined on the basis of the daily water demand under established assumptions regarding user behaviour and presence days:

$$\mathbf{wd_I = (n_U * f_I * cv_I * d/a) / 1000} \qquad \textbf{(3)}$$

where

- wd_I Specific potable water demand of installations in the building in [m³/a]
- n_U Number of users
- f_I Installation-specific factor for water use in accordance with Table 1, in [seconds/day] or [flushes/day]
- cv_I Installation-specific consumption value in [litres/seconds] or [litres/flush]
- d Presence days (= 210 days)
- a Year

The waste water produced by users (WW_U) is calculated as the total of the specific water demand of the installations, subtracting reused grey water and/or waste water purified via decentralised treatment on-site:

$$.\mathbf{WW_U = \sum_{i=1}^{n} wd_I - N_{GW} - R_{BW}} \qquad \textbf{(4)}$$

where

- WW_U Waste water by users in [m³/a]
- wd_I Specific potable water demand of installations in the building in [m³/a]

- N_{GW} Amount of grey water reused, e.g. to flush toilets, in [m³/a]
- R_{BW} Amount of waste water purified on-site in [m³/a]

The amount of purified waste water can be taken from the design of the decentralised (small) sewage treatment plant.

Table 1: Specifications for user behaviour

INSTALLATION	INSTALLATION-SPECIFIC FACTOR F_I FOR WATER USE [SECONDS OR FLUSHES PER PERSON AND DAY]
Hand washbasin	45
Water-saving WC flush	1
WC	1
Urinal	1
Shower	30
Kitchen sink	20

The installation-specific factors are derived from the assumptions that:

- Each user washes their hands three times a day, for 15 seconds each time
- The ratio of water-saving WC flush/urinal usage to normal WC flush usage is 2:1; this assumes an equal gender ratio (50% each)
- 10% of employees shower daily, for 5 minutes each time (if shower facilities are available)
- The kitchen sink is used to wash up e.g. one cup per employee

Table 2: Specifications for the limit value of the installation-specific consumption value (cvI) in [litres/second] or [litres/flush]

INSTALLATION	CONSUMPTION VALUE (IN LITRES/SECOND OR LITRES/FLUSH)
Hand washbasin (litres/second)	0.15
Water-saving WC flush (litres/flush)	3
WC (litres/flush)	6
Urinal (litres/flush)	1.5
Shower (litres/second)	0.25
Kitchen sink (litres/second)	0.25

Residential

Indicator 1: Potable water demand and waste water volume – by users

Presence days for the specific water requirements of existing installations wbi:

- d presence days (=345 d)

Table 3: Specifications for user behaviour

INSTALLATION	INSTALLATION-SPECIFIC FACTOR F_i FOR WATER USE IN [SECONDS OR FLUSHES PER PERSON AND DAY]
Hand washbasin	195
Water-saving WC flush	4
WC	1
Shower	120
Dishwasher	0.5
Washing machine	0.25

Dwellings with bathtubs:
In terms of saving water, showering is clearly preferable to bathing. Bathtub types must be selected that can also be used for showering without compromising comfort or convenience.
For bathtubs, the water savings are directly proportional to the volume of the bathtub. The smaller the bathtub, the greater the possible water savings.
The type of distribution fitting does not affect the water demand when filling the bathtub. Savings as a result of the fittings are only possible in the case of showers.
For dwellings with bathtubs, it is assumed that they are used to take a bath with a full bathtub once every 14 days, and are used for showering on the remaining days.

Table 4: Specifications for the limit value of the installation-specific consumption value (cvl) in [litres/second] or [litres/flush]

INSTALLATION	CONSUMPTION VALUE (IN LITRES/SECOND OR LITRES/FLUSH)
Hand washbasin (litres/second)	0.15
Water-saving WC flush (litres/flush)	3
WC (litres/flush)	6
Shower (litres/second)	0.25
Bathtub (litres/full bathtub)	70 (volume)
Dishwasher (litres/wash cycle)	20
Washing machine (litres/wash cycle)	60

Production

Indicator 1: Potable water demand and waste water volume – by users

Presence days for the specific water requirements of existing installations wbi:

- d presence days (=260 d)

Table 5: Specifications for user behaviour

INSTALLATION	INSTALLATION-SPECIFIC FACTOR F_i FOR WATER USE [SECONDS OR FLUSHES PER PERSON AND DAY]
Hand washbasin	90
Water-saving WC flush	1
WC	1
Urinal	1
Shower	150
Kitchen sink	20

The installation-specific factors are derived from the assumptions that:

- Each employee washes their hands three times a day, for 30 seconds each time
- The ratio of water-saving WC flush/urinal usage to normal WC flush usage is 2:1; this assumes an equal gender ratio (50% each)
- 50% of employees shower daily, for 5 minutes each time (if shower facilities are available)
- The kitchen sink is used to wash up e.g. one cup per employee

Table 6: Specifications for the limit value of the installation-specific consumption value (cvl) in [litres/second] or [litres/flush]

INSTALLATION	CONSUMPTION VALUE (IN LITRES/SECOND OR LITRES/FLUSH)
Hand washbasin (litres/second)	0.15
Water-saving WC flush (litres/flush)	3
WC (litres/flush)	6
Urinal (litres/flush)	1.5
Shower (litres/second)	0.25
Kitchen sink (litres/second)	0.25

Supermarket **Shopping centre** **Department store** **Assembly buildings**

Indicator 1: Potable water demand and waste water volume – by users

$$WD_U = WD_E + WD_{CU} \quad (2)$$

where

- WD_U Water demand by users in [m³/a]
- WD_E Water demand by employees in [m³/a]
- WD_{CU} Water demand by customers in [m³/a]

$$WW_U = WW_E + WW_{CU} \quad (3)$$

where

- WW_U Waste water by users in [m³/a]
- WW_E Waste water by employees in [m³/a]
- WW_{CU} Waste water by customers in [m³/a]

Employees

The water demand of employees (WD_E) is determined from the total of the potable water demand of installations under the established assumptions regarding user behaviour. Use of rainwater, river water or grey water that replaces the use of potable water is subtracted from the water demand:

$$\mathbf{WD_E} = \sum_{i=1}^{n} \mathbf{wd_I} - \mathbf{N_{RW}} - \mathbf{N_{GW}} \quad (4)$$

where

- WD_E Water demand by employees in [m³/a]
- wd_I Specific water demand of installations in the building in [m³/a]
- N_{RW} Amount of rainwater or river water used, e.g. to flush toilets, in [m³/a]
- N_{GW} Amount of grey water used, e.g. to flush toilets, in [m³/a]

The amount of rainwater, river water and grey water used can be taken from the profitability calculation for use of rainwater, river water and grey water.

The specific water demand of installations (wd_I) is determined on the basis of the daily water demand under established assumptions regarding user behaviour and presence days:

$$wd_I = (n_E * f_I * cv_I * d/a) / 1000 \quad (5)$$

where

- wd_I Specific potable water demand of installations in the building in [m³/a]
- n_E Number of employees
- f_I Installation-specific factor for water use in accordance with Table 1, in [seconds/day] or [flushes/day]
- cv_I Installation-specific consumption value in [litres/seconds] or [litres/flush]
- d Presence days according to the table 7
- a Year

The waste water produced by employees (WW_E) is calculated as the total of the specific water demand of the installations, subtracting reused grey water and/or waste water purified via decentralised treatment on-site:

$$\mathbf{WW_E = \sum_{i=1}^{n} wd_I - N_{GW} - R_{BW}} \qquad \textbf{(6)}$$

where

- WW_E Waste water by employees in [m³/a]
- wd_I Specific potable water demand of installations in the building in [m³/a]
- N_{GW} Amount of grey water reused, e.g. to flush toilets, in [m³/a]
- R_{BW} Amount of waste water purified on-site in [m³/a]

The amount of purified waste water can be taken from the design of the decentralised (small) sewage treatment plant.

Table 7: Specifications for days of attendance

BUILDING USE	PRESENCE DAYS IN YEAR
Consumer market, Department stores Shopping centre	312
Congress, - Trade fair, - and Municipal halls,	150
Museums, Exhibition halls	250
Theatre and Concert halls	250
Libraries	300

Specification (days of attendance per use profile) of table 7 is based on DIN V 18599-10: 2016-10 (Table 5 - Guide values for the boundary conditions for non-residential buildings).

Customers

The water demand of customers (WD_{CU}) is determined from the total of the potable water demand of installations under the established assumptions regarding user behaviour. Use of rainwater, river water or grey water that replaces the use of potable water is subtracted from the water demand:

$$\mathbf{WD_{CU} = \sum_{i=1}^{n} wd_I - N_{RW} - N_{GW}} \qquad \textbf{(7)}$$

where

- WD_{CU} Water demand by customers in [m³/a]

- wd_I Specific water demand of installations in the building in [m³/a]
- N_{RW} Amount of rainwater or river water used, e.g. to flush toilets, in [m³/a]
- N_{GW} Amount of grey water used, e.g. to flush toilets, in [m³/a]

The amount of rainwater, river water and grey water used can be taken from the profitability calculation for use of rainwater, river water and grey water.

The specific water demand of installations (wd_I) is determined on the basis of the daily water demand under established assumptions regarding user behaviour and presence days:

$$wd_I = (n_{CU} * f_I * as_I * d/a) / 1000 \qquad (8)$$

where

- wd_I Specific potable water demand of installations in the building in [m³/a]
- n_{CU} Number of customers
- f_I Installation-specific factor for water use in accordance with Table 1, in [seconds/day] or [flushes/day]
- cv_I Installation-specific consumption value in [litres/seconds] or [litres/flush]
- d Presence days according to the table 7
- a Year

Consumer market **Department stores** **Shopping centre**

- It is assumed that 5% of customers use the sanitary facilities.

Assembly buildings

The maximum number of customers according to the seating plan of the largest event hall located in the building or assigned to the building. Alternatively, the maximum number of authorized visitors (customers) can be used. The number of customers determined in this way must be multiplied by the following factor in order to determine the average number of customers on annual usage:

- **0.5** for Assembly buildings that are designed for predominantly seated events (e.g. congress, theatre, cinema)
- **0.3** for Assembly buildings that are designed for both seated and standing events (such as exhibition halls, town halls) Alternatively, another basis can be used to determine the number of visitors, if this is reasonably justified and corresponds to the building and the operating concept.

The waste water produced by customers (WW_{CU}) is calculated as the total of the specific water demand of the installations, subtracting reused grey water and/or waste water purified via decentralised treatment on-site:

$$\mathbf{WW_{CU}} = \sum_{i=1}^{n} \mathbf{wd_I} - \mathbf{N_{GW}} - \mathbf{R_{BW}} \qquad (9)$$

where

- WW_{CU} Waste water by customers in [m³/a]
- wd_I Specific potable water demand of installations in the building in [m³/a]
- N_{GW} Amount of grey water reused, e.g. to flush toilets, in [m³/a]
- R_{BW} Amount of waste water purified on-site in [m³/a]

The amount of purified waste water can be taken from the design of the decentralised (small) sewage treatment plant.

Table 8: Specifications for user behaviour

INSTALLATION	INSTALLATION-SPECIFIC FACTOR F_I FOR WATER USE [SECONDS OR FLUSHES PER PERSON AND DAY]	
	EMPLOYEES	CUSTOMERS
Hand washbasin	45	15
Water-saving WC flush	1	0.3
WC	1	0.5
Urinal	1	0.2
Shower	30	-
Kitchen sink	20	-

The installation-specific factors are derived from the assumptions that:

Employees

- Each employee washes their hands three times a day, for 15 seconds each time
- The ratio of water-saving WC flush/urinal usage to normal WC flush usage is 2:1; this assumes an equal gender ratio (50% each)
- 10% of employees shower daily, for 5 minutes each time (if shower facilities are available)
- The kitchen sink is used to wash up e.g. one cup per employee.

Customers

- 5% of customers use the sanitary facilities
- The customers using the sanitary facilities are 60% female customers and 40% male customers
- Each user washes their hands for an average of 15 seconds
- Female customers use the water-saving WC flush and the normal WC flush in a 1:1 ratio, while male customers use the urinal/water-saving WC flush and the normal WC flush in a 1:1 ratio

Hotel

Indicator 1: Potable water demand and waste water volume – by users

The water demand of guests (WD_U) is determined from the total of the potable water demand of installations under the established assumptions regarding user behaviour. Use of rainwater, river water or grey water that replaces the use of potable water is subtracted from the water demand:

$$\mathbf{WD_U} = \sum_{i=1}^{n} \mathbf{wd_I} - \mathbf{N_{RW}} - \mathbf{N_{GW}} \qquad \textbf{(2)}$$

where

- WD_U Water demand by guests in [m³/a]
- wd_I Specific water demand of installations in the building in [m³/a]
- N_{RW} Amount of rainwater or river water used, e.g. to flush toilets, in [m³/a]
- N_{GW} Amount of grey water used, e.g. to flush toilets, in [m³/a]

The amount of rainwater, river water and grey water used can be taken from the profitability calculation for use of rainwater, river water and grey water.

The specific water demand of installations (wd_I) is determined on the basis of the daily water demand under established assumptions regarding user behaviour and presence days:

$$wd_I = (n_U * f_I * cv_I * d/a) / 1000 \qquad (3)$$

where

- wd_I Specific potable water demand of installations in the building in [m³/a]
- n_U Number of guests
- f_I Installation-specific factor for water use in accordance with Table 1, in [seconds/day] or [flushes/day]
- cv_I Installation-specific consumption value in [litres/seconds] or [litres/flush]
- d Presence days (= 360 days)
- a Year

The specific water demand of installations (wd_I) is determined on the basis of the daily water demand under the assumption of 360 days of occupancy, usage of 65% of the total capacity and an average occupancy for double rooms of 1.2 people:

$$n_U = (n_{SR} + (n_{DR} * 1.2)) * 0.65 \qquad (4)$$

where

- n_U Number of guests
- n_{SR} Number of single rooms
- n_{DR} Number of double rooms

The waste water produced by guests (WW_U) is calculated as the total of the specific water demand of the installations, subtracting reused grey water and/or waste water purified via decentralised treatment on-site:

$$\mathbf{WW_U} = \sum_{i=1}^{n} \mathbf{wd_I} - \mathbf{N_{GW}} - \mathbf{R_{BW}} \qquad (5)$$

where

- WW_U Waste water by guests in [m³/a]
- wd_I Specific potable water demand of installations in the building in [m³/a]
- N_{GW} Amount of grey water reused, e.g. to flush toilets, in [m³/a]
- R_{BW} Amount of waste water purified on-site in [m³/a]

The amount of purified waste water can be taken from the design of the decentralised (small) sewage treatment plant.

Table 9: Specifications for user behaviour

INSTALLATION	INSTALLATION-SPECIFIC FACTOR F_I FOR WATER USE [SECONDS OR FLUSHES PER PERSON AND DAY]
Hand washbasin	75
Water-saving WC flush	1
WC	1
Urinal	1
Hand washbasin in SPA	15
Water-saving WC flush in SPA	1
Shower in SPA	600

The installation-specific factors are derived from the assumptions that:

- Each guest uses the hand washbasin once a day, for 75 seconds each time
- The water-saving WC flush or urinal is used twice per overnight stay, and the normal WC flush is used once per overnight stay
- The shower is used for 300 seconds per overnight stay
- In the spa area, the hand washbasin is used for 15 seconds per spa visitor, the shower is used for 600 seconds per spa visitor and the water-saving WC flush is used once per spa visitor
- Swimming pools are not taken into consideration

Table 10: Specifications for the limit value of the installation-specific consumption value (cvI) in [litres/second] or [litres/flush]

INSTALLATION	CONSUMPTION VALUE (IN LITRES/SECOND OR LITRES/FLUSH)
Hand washbasin (litres/second)	0.15
Water-saving WC flush (litres/flush)	3
WC (litres/flush)	6
Shower (litres/second)	0.25

Indicator 1: Potable water demand and waste water volume – waste water due to rainwater diverted to the drain system

The portion of rainwater diverted to the drain system (WW_{RW}) is determined as follows:

$$\mathbf{WW_{RW} = N_P - P_{RW} - N_{RW}} \qquad \mathbf{(6)}$$

where

- WW_{RW} Waste water due to rainwater diverted to the drain system
- N_P Amount of precipitation in [m³/a]
- P_{RW} Amount of rainwater infiltrating into soil or diverted into rivers or canals in [m³/a]

- N_{RW} Amount of rainwater used, e.g. to flush toilets, in [m³/a]

Suitable documentation of the amount of rainwater infiltrating into the soil must be provided. The amount of precipitation to be taken into consideration N_P is determined as follows:

$$N_P = (A_R * e_R + A_S * e_S) * S_{RW} / 1000 \qquad (7)$$

where

- A_R Roof surface area
- A_S Sealed surface area [m²]
- e_R Yield coefficient of roof surface
- e_S Yield coefficient of sealed ground surface
- S_{RW} Site-specific annual precipitation

Table 11: Specifications for the limit value for the drainage of rainwater

Yield coefficient of roof surface	0.8
Yield coefficient of ground	0.8

Outdoor green spaces with natural infiltration have a yield coefficient of 0.0.
The plot area that must be taken into account is the plot area, not including the building floor area.

Table 72: Yield coefficients[2]

CONDITION	YIELD COEFFICIENT % E
Sloped hard roof (deviations depending on the absorbency and roughness)	0.8
Flat roof, not gravelled	0.8
Flat roof, gravelled	0.6
Green roof, intensive	0.3
Green roof, extensive	0.5
Paved area/interlocking paved area	0.5
Asphalt surface	0.8

Indicator 1: Potable water demand and waste water volume – by the spa area
The water demand of the spa area (WD_{SPA}) is determined from the total of the potable water demand of installations under the established assumptions regarding user behaviour:

[2] In accordance with DIN 1989

$$\mathbf{WD_{SPA}} = \sum_{i=1}^{n} \mathbf{wd_I} - \mathbf{N_{RW}} - \mathbf{N_{GW}} \qquad \textbf{(8)}$$

where

- WD_{SPA} Water demand by spa visitors in [m³/a]
- wd_I Specific water demand of installations in the building in [m³/a]
- N_{RW} Amount of rainwater used, e.g. to flush toilets, in [m³/a]
- N_{GW} Amount of grey water used, e.g. to flush toilets, in [m³/a]

The specific water demand of installations (wd_I) is determined on the basis of the daily water demand under the assumption of the spa area being open for 360 days and usage by 25% of the average total guests staying overnight:

$$\mathbf{n_{SPA} = n_U * 0.25} \qquad \textbf{(9)}$$

where

- n_{SPA} Number of spa visitors
- n_U Number of guests

$$\mathbf{wd_I = (n_{SPA} * f_I * cv_I * 360\ d/a) / 1000} \qquad \textbf{(10)}$$

where

- wd_I Specific water demand of installations in the building in [m³/a]
- n_{SPA} Number of spa visitors
- f_I Installation-specific factor for water use in accordance with Table 1, in [seconds/day] or [flushes/day]
- cv_I Installation-specific consumption value in accordance with Table 9 in [litres/second] or [litres/flush]

The waste water produced by spa guests (WW_{SPA}) is calculated as the total of the specific water demand of the installations, subtracting reused waste water or waste water purified via decentralised treatment on-site plus the amount of rainwater used for flushing toilets:

$$\mathbf{WW_{SPA}} = \sum_{i=1}^{n} \mathbf{wd_I} - \mathbf{N_{GW}} - \mathbf{R_{BW}} - \mathbf{N_{RW}} \qquad \textbf{(11)}$$

where

- WW_{SPA} Waste water for spa visitors in [m³/a]
- wd_I Specific water demand of installations in the building in [m³/a]
- N_{GW} Amount of grey water reused, e.g. to flush toilets, in [m³/a]
- R_{BW} Amount of waste water purified on-site in [m³/a]
- N_{RW} Amount of rainwater used, e.g. to flush toilets, in [m³/a]

The amount of waste water used can be taken from the profitability calculation for use of waste water, while the amount of purified waste water can be taken from the design of the decentralised (small) sewage treatment plant.

Indicator 1: Calculation of the limit value (Benchmarks)

The limit value (L) is determined according to the formulas in Table 13, here neither grey nor rain or River water use or decentralized wastewater treatment taken into account:

Table 13: Dynamic limit value formulas

Office Education Logistics	
Building without shower	L (m³/a) = (n_U *9.35 m³/a_U) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Building with shower	L (m³/a) = (n_U*12.5 m³/a_U) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Residential	
Buildings without bathtubs	L (m³/a) = (n_U *70.6 m³/a) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Buildings with bathtubs	L (m³/a) = (n_U*72.6 m³/a) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Consumer market Department stores Shopping centre	
Building without shower	L (m³/a) = (n_E*13.9 m³/a_E) + (0.05*n_{CU}*5.5 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Building with shower	L (m³/a) = (n_E*18.6 m³/a_E) + (0.05*n_{CU}*5.5 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Production	
Building without shower	L (m³/a) = (n_U *15.1 m³/a) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Building with shower	L (m³/a) = (n_U*34.6 m³/a) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Hotel	
Building without spa	L (m³/a) = (n_U *69.7 m³/a) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Building with spa	L (m³/a) = (n_U*69.7 m³/a) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000 + (n_{SPA} *113.0 m³/a)
Assembly buildings Congress, - Trade fair, - and Municipal halls	
Building without shower	L (m³/a) = (n_E*6.5 m³/a_E) + (0.3*n_{CU}*2.57 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Building with shower	L (m³/a) = (n_E*8.75 m³/a_E) + (0.3*n_{CU}*2.59 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000

Assembly buildings
Museums, Exhibition halls

Building without shower	L (m³/a) = (n_E*10.83 m³/a_E) + (0.3*n_{CU}*4.28 m³/a_{CU}) + (A_R*0,8 + A_S*0.8)* S_{RW}/1000
Building with shower	L (m³/a) = (n_E*14.58 m³/a_E) + (0.3*n_{CU}*4,31 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000

Assembly buildings
Theatre und Concert halls

Building without shower	L (m³/a) = (n_E*10.64 m³/a_E) + (0.5*n_{CU}*4.21 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Building with shower	L (m³/a) = (n_E*14.37 m³/a_E) + (0.5*n_{CU}*4.25 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000

Assembly buildings
Libraries

Building without shower	L (m³/a) = (n_E*12.77 m³/a_E) + (0.5*n_{CU}*5.05 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000
Building with shower	L (m³/a) = (n_E*17.25 m³/a_E) + (0.5*n_{CU}*5.1 m³/a_{CU}) + (A_R*0.8 + A_S*0.8)* S_{RW}/1000

Office **Education** **Hotel** **Consumer market** **Department stores** **Logistics** **Production** **Shopping centre** **Assembly buildings**

The reference (R) and target value (T) result from discount factors:
R = X * G
T = Y * G

The associated values of X and Y are set as follows:
X = 0.66
Y = 0.33

Residential

The associated values of X and Y are set as follows:
X = 0.68
Y = 0.46

Indicator 2: Outdoor facilities

The evaluation is carried out based on two qualitative questions. The first question is whether watering the outdoor facilities with potable water is intended or not. The second question is whether the outdoor facilities include rainwater retention devices.

Indicator 3: Integration into the district infrastructure

The degree of integration into the district infrastructure is evaluated on the basis of a qualitative question. If the building's rainwater and waste water disposal method is fully geared towards the existing infrastructure in the surrounding district and uses all available opportunities for separation, reduction, etc., this can be incorporated positively into the evaluation.

Appendix 1: country specific water stress indicator (WSI)

The table below refers to the working paper WRI (World Recourses Institute) a weighted aggregation methodology that brings Aqueduct's granular sub-basin level information up to the country and river basin scale, generating global rankings of water-quantity-related risks for all users, as well as sector-specific rankings for agricultural, municipal, and industrial water users.

Baseline Water Stress (definition)
Baseline water stress measures the ratio of total water withdrawals to available renewable water supplies. Water withdrawals include domestic, industrial, irrigation and livestock consumptive and non-consumptive uses. Available renewable water supplies include surface and groundwater supplies and consider the impact of upstream consumptive water users and large dams on downstream water availability. Higher values (total score) indicate more competition among users.

Table 14: Aqueduct Country Rankings: https://www.wri.org/applications/aqueduct/country-rankings/

Name	Abbr.	Total score	Rank	Category	Label
Qatar	QAT	4,97	1	4	Extremely High (>80%)
Israel	ISR	4,82	2	4	Extremely High (>80%)
Lebanon	LBN	4,82	3	4	Extremely High (>80%)
Iran	IRN	4,57	4	4	Extremely High (>80%)
Jordan	JOR	4,56	5	4	Extremely High (>80%)
Libya	LBY	4,55	6	4	Extremely High (>80%)
Kuwait	KWT	4,43	7	4	Extremely High (>80%)
Saudi Arabia	SAU	4,35	8	4	Extremely High (>80%)
Eritrea	ERI	4,33	9	4	Extremely High (>80%)
United Arab Emirates	ARE	4,26	10	4	Extremely High (>80%)
San Marino	SMR	4,14	11	4	Extremely High (>80%)
Bahrain	BHR	4,13	12	4	Extremely High (>80%)
India	IND	4,12	13	4	Extremely High (>80%)
Pakistan	PAK	4,05	14	4	Extremely High (>80%)
Turkmenistan	TKM	4,04	15	4	Extremely High (>80%)
Oman	OMN	4,04	16	4	Extremely High (>80%)
Botswana	BWA	4,02	17	4	Extremely High (>80%)
Chile	CHL	3,98	18	3	High (40-80%)
Cyprus	CYP	3,97	19	3	High (40-80%)
Yemen	YEM	3,97	20	3	High (40-80%)
Andorra	AND	3,92	21	3	High (40-80%)
Morocco	MAR	3,89	22	3	High (40-80%)
Belgium	BEL	3,89	23	3	High (40-80%)
Mexico	MEX	3,86	24	3	High (40-80%)
Uzbekistan	UZB	3,82	25	3	High (40-80%)
Greece	GRC	3,80	26	3	High (40-80%)
Afghanistan	AFG	3,80	27	3	High (40-80%)

Spain	ESP	3,74	28	3	High (40-80%)
Algeria	DZA	3,69	29	3	High (40-80%)
Tunisia	TUN	3,67	30	3	High (40-80%)
Syria	SYR	3,64	31	3	High (40-80%)
Turkey	TUR	3,56	32	3	High (40-80%)
Albania	ALB	3,53	33	3	High (40-80%)
Armenia	ARM	3,43	34	3	High (40-80%)
Burkina Faso	BFA	3,42	35	3	High (40-80%)
Djibouti	DJI	3,37	36	3	High (40-80%)
Namibia	NAM	3,31	37	3	High (40-80%)
Kyrgyzstan	KGZ	3,31	38	3	High (40-80%)
Niger	NER	3,28	39	3	High (40-80%)
Nepal	NPL	3,17	40	3	High (40-80%)
Portugal	PRT	3,14	41	3	High (40-80%)
Iraq	IRQ	3,13	42	3	High (40-80%)
Egypt	EGY	3,07	43	3	High (40-80%)
Italy	ITA	3,01	44	3	High (40-80%)
Thailand	THA	2,98	45	2	Medium - High (20-40%)
Azerbaijan	AZE	2,94	46	2	Medium - High (20-40%)
Sudan	SDN	2,92	47	2	Medium - High (20-40%)
South Africa	ZAF	2,89	48	2	Medium - High (20-40%)
Luxembourg	LUX	2,86	49	2	Medium - High (20-40%)
Australia	AUS	2,67	50	2	Medium - High (20-40%)
Tajikistan	TJK	2,65	51	2	Medium - High (20-40%)
Macedonia	MKD	2,59	52	2	Medium - High (20-40%)
South Korea	KOR	2,55	53	2	Medium - High (20-40%)
Bulgaria	BGR	2,53	54	2	Medium - High (20-40%)
Mongolia	MNG	2,51	55	2	Medium - High (20-40%)
China	CHN	2,40	56	2	Medium - High (20-40%)
Guatemala	GTM	2,36	57	2	Medium - High (20-40%)
Estonia	EST	2,26	58	2	Medium - High (20-40%)
France	FRA	2,19	59	2	Medium - High (20-40%)
Kazakhstan	KAZ	2,16	60	2	Medium - High (20-40%)
Mauritania	MRT	2,14	61	2	Medium - High (20-40%)
Germany	DEU	2,14	62	2	Medium - High (20-40%)
Lesotho	LSO	2,13	63	2	Medium - High (20-40%)
Denmark	DNK	2,08	64	2	Medium - High (20-40%)
Indonesia	IDN	2,07	65	2	Medium - High (20-40%)
Peru	PER	2,05	66	2	Medium - High (20-40%)
Venezuela	VEN	2,03	67	2	Medium - High (20-40%)
Cuba	CUB	2,02	68	2	Medium - High (20-40%)
North Korea	PRK	1,95	69	1	Low - Medium (10-20%)

Romania	ROU	1,85	70	1	Low - Medium (10-20%)
United States	USA	1,85	71	1	Low - Medium (10-20%)
Zimbabwe	ZWE	1,79	72	1	Low - Medium (10-20%)
Dominican Republic	DOM	1,75	73	1	Low - Medium (10-20%)
Haiti	HTI	1,74	74	1	Low - Medium (10-20%)
Japan	JPN	1,66	75	1	Low - Medium (10-20%)
Angola	AGO	1,66	76	1	Low - Medium (10-20%)
Sri Lanka	LKA	1,66	77	1	Low - Medium (10-20%)
El Salvador	SLV	1,66	78	1	Low - Medium (10-20%)
Tanzania	TZA	1,63	79	1	Low - Medium (10-20%)
Netherlands	NLD	1,61	80	1	Low - Medium (10-20%)
Ecuador	ECU	1,59	81	1	Low - Medium (10-20%)
Lithuania	LTU	1,59	82	1	Low - Medium (10-20%)
Philippines	PHL	1,55	83	1	Low - Medium (10-20%)
South Sudan	SSD	1,52	84	1	Low - Medium (10-20%)
Ukraine	UKR	1,49	85	1	Low - Medium (10-20%)
Poland	POL	1,48	86	1	Low - Medium (10-20%)
Chad	TCD	1,44	87	1	Low - Medium (10-20%)
Senegal	SEN	1,44	88	1	Low - Medium (10-20%)
United Kingdom	GBR	1,40	89	1	Low - Medium (10-20%)
Georgia	GEO	1,39	90	1	Low - Medium (10-20%)
Nigeria	NGA	1,39	91	1	Low - Medium (10-20%)
Argentina	ARG	1,31	92	1	Low - Medium (10-20%)
Czech Republic	CZE	1,29	93	1	Low - Medium (10-20%)
Russia	RUS	1,22	94	1	Low - Medium (10-20%)
Bolivia	BOL	1,15	95	1	Low - Medium (10-20%)
Ethiopia	ETH	1,11	96	1	Low - Medium (10-20%)
Bosnia and Herzegovina	BIH	1,10	97	1	Low - Medium (10-20%)
Swaziland	SWZ	1,08	98	1	Low - Medium (10-20%)
Moldova	MDA	1,06	99	1	Low - Medium (10-20%)
Somalia	SOM	1,01	100	1	Low - Medium (10-20%)
Rwanda	RWA	0,99	101	0	Low (<10%)
Liechtenstein	LIE	0,99	102	0	Low (<10%)
Guinea-Bissau	GNB	0,98	103	0	Low (<10%)
Mozambique	MOZ	0,98	104	0	Low (<10%)
Vietnam	VNM	0,94	105	0	Low (<10%)
Kenya	KEN	0,93	106	0	Low (<10%)
Costa Rica	CRI	0,92	107	0	Low (<10%)
Canada	CAN	0,88	108	0	Low (<10%)
Serbia	SRB	0,83	109	0	Low (<10%)
Zambia	ZMB	0,81	110	0	Low (<10%)
Switzerland	CHE	0,80	111	0	Low (<10%)

Brazil	BRA	0,78	112	0	Low (<10%)
Hungary	HUN	0,77	113	0	Low (<10%)
Ghana	GHA	0,75	114	0	Low (<10%)
Belarus	BLR	0,75	115	0	Low (<10%)
Madagascar	MDG	0,69	116	0	Low (<10%)
Slovenia	SVN	0,66	117	0	Low (<10%)
Colombia	COL	0,65	118	0	Low (<10%)
Myanmar	MMR	0,65	119	0	Low (<10%)
Belize	BLZ	0,62	120	0	Low (<10%)
Montenegro	MNE	0,58	121	0	Low (<10%)
Malawi	MWI	0,56	122	0	Low (<10%)
Mali	MLI	0,55	123	0	Low (<10%)
Finland	FIN	0,54	124	0	Low (<10%)
Slovakia	SVK	0,50	125	0	Low (<10%)
Ireland	IRL	0,46	126	0	Low (<10%)
Sweden	SWE	0,44	127	0	Low (<10%)
Bangladesh	BGD	0,43	128	0	Low (<10%)
Cambodia	KHM	0,42	129	0	Low (<10%)
Burundi	BDI	0,42	130	0	Low (<10%)
Latvia	LVA	0,38	131	0	Low (<10%)
Malaysia	MYS	0,28	132	0	Low (<10%)
Honduras	HND	0,27	133	0	Low (<10%)
Austria	AUT	0,27	134	0	Low (<10%)
Uganda	UGA	0,26	135	0	Low (<10%)
Panama	PAN	0,23	136	0	Low (<10%)
Nicaragua	NIC	0,21	137	0	Low (<10%)
Guinea	GIN	0,19	138	0	Low (<10%)
Benin	BEN	0,18	139	0	Low (<10%)
Croatia	HRV	0,18	140	0	Low (<10%)
Papua New Guinea	PNG	0,06	141	0	Low (<10%)
New Zealand	NZL	0,05	142	0	Low (<10%)
Democratic Republic of the Congo	COD	0,04	143	0	Low (<10%)
Côte d'Ivoire	CIV	0,04	144	0	Low (<10%)
Cameroon	CMR	0,04	145	0	Low (<10%)
Gambia	GMB	0,04	146	0	Low (<10%)
Laos	LAO	0,03	147	0	Low (<10%)
Central African Republic	CAF	0,03	148	0	Low (<10%)
Sierra Leone	SLE	0,01	149	0	Low (<10%)
Paraguay	PRY	0,01	150	0	Low (<10%)
Uruguay	URY	0,00	151	0	Low (<10%)
Togo	TGO	0,00	152	0	Low (<10%)

Norway	NOR	0,00	153	0	Low (<10%)
Republic of Congo	COG	0,00	154	0	Low (<10%)
Bhutan	BTN	0,00	155	0	Low (<10%)
Timor-Leste	TLS	0,00	156	0	Low (<10%)
Brunei	BRN	0,00	157	0	Low (<10%)
Gabon	GAB	0,00	157	0	Low (<10%)
Equatorial Guinea	GNQ	0,00	157	0	Low (<10%)
Guyana	GUY	0,00	157	0	Low (<10%)
Iceland	ISL	0,00	157	0	Low (<10%)
Jamaica	JAM	0,00	157	0	Low (<10%)
Liberia	LBR	0,00	157	0	Low (<10%)
Suriname	SUR	0,00	157	0	Low (<10%)

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators.

Indicator 1: Potable water and waste water volume
Indicator 1.1: Water use value

- Calculation of the water use value (WUV)

Clear calculation of the water use value for the constructed building and the limit value, reference value and target value throughout the calculation process for the criterion. All results and interim results of the calculation must be clearly presented here, e.g. in the form of a table.

- If river water is used, the following points must be noted:

(1) Extraction of river water:
River water can be used within the building as an alternative to grey water or rainwater for flushing toilets, etc., if the building is in the immediate vicinity of such a body of water. If rainwater is discharged into the body of water at the same time, this would form a cycle of discharge and extraction.
(2) Discharge of non-hazardous rainwater into surface waters (rivers/canals/streams)
Requirement: Permission for discharge into a surface body of water in accordance with local regulations and an exemption from compulsory connection and usage.

- Potable water demand and waste water volume by users
  - Number of employees
  - Flow rate values for fittings from data sheets
  - Amount of rainwater or river water used
  - Amount of grey water used
  - Amount of waste water purified via decentralised treatment, e.g. as a result of the design of the sewage treatment plant

- Waste water due to rainwater diverted to the drain system
  - Plausible determination of the annual rainfall at the site
  - Plausible determination of river water discharge
  - Plausible calculation of sealed areas and green spaces
  - Plausible determination of the yield coefficients of the sealed areas according to the table 12

- Calculation of the rainwater used for watering or flushing toilets

Indicator 2: External works
Indicator 2.1: Watering and rainwater retention

- Documents in the form of plans, photos, etc., including details of rainwater retention

Indicator 3: Integration into the district infrastructure
Indicator 3.1: Level of integration

- Documents regarding rainwater and waste water disposal systems in the building and the surrounding district, including photos of the implemented measures (and localisation in an overall plan) if necessary

Country specific adaptation (optional):

- WSI to be communicated with the DGNB during the adaptation process, the country specific (incl. province specific) WSI can be downloaded as an Excel file from the following link: https://www.wri.org/applications/aqueduct/country-rankings/

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
all	General and Method: scheme „Assembly buildings" has been added	16.09.2021
185	Method indicator 1: presence days Production scheme has been added	16.09.2021
188	Benchmarks: Table 7, presence days have been added for variety of "Assembly buildings" sub-uses, congress halls, libraries, theatres etc.	16.09.2021
195	Benchmarks indicator 1: Table 11, unit corrections	16.09.2021
197	Benchmarks Indicator 1: Calculation of the usage-specific limit and target values	16.09.2021

II. Literature

- DIN EN 246. Sanitary tapware – General specifications for flow rate regulators. Berlin: Beuth publisher. November 2003
- DIN 1989-1. Rainwater harvesting systems – Part 1: Planning, installation, operation and maintenance. Berlin: Beuth publisher. April 2002
- DIN 1988/3. Drinking water supply systems; pipe sizing (DVGW code of practice). Berlin: Beuth publisher. December 1988
- DIN EN 12056-1. Gravity drainage systems inside buildings – Part 1: General and performance requirements. Berlin: Beuth publisher. January 2001
- VDI 3818. Public sanitary facilities. Düsseldorf: Verein Deutscher Ingenieure. February 2008
- VDI 6024 sheet 1, Table 10: Saving of water in drinking-water installations – Requirements for planning, installation, operation, and maintenance. Düsseldorf: Verein Deutscher Ingenieure. September 2008
- Feurich. Sanitärtechnik [Sanitary engineering], 9th edition, Düsseldorf 2005; pages 12-29 (specifies the water consumption for administrative and office buildings as 20 to 25 litres per working day and employee)
- Sustainable Development Goals icons, United Nations/globalgoals.org
- "Aqueduct country and river basin rankings: a weighted aggregation of spatially distinct hydrological indicators." Working paper. Washington, DC: World Resources Institute

ENV2.3

Land use

Objective

Our objective is to reduce the excess use of land for building purposes and limit soil sealing in undeveloped areas.

Benefits

Using land and soil sparingly and in a way that minimises the impact on this land and soil is necessary not just from an ecological standpoint; against a backdrop of increasing infrastructure costs, financial aspects must also be considered. Sparing use of land that minimises the impact on this land at a local level, results in lower development, waste water charges and an improved microclimate.

Contribution to high-priority sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant			11.1.a	Land use
Moderate	15.3	Soil quality protection	11.1.b/c	Land use
Low	11.5	Impact of catastrophes		

Outlook

Reducing land use is an important national sustainability goal. For this reason, this criterion will be retained in later versions and will focus more heavily on achieving overriding objectives.

Share of total score

	SHARE	RELEVANCE FACTOR
Office Education Residential Hotel Consumer market Department stores Logistics Production	2.4%	2
Shopping centre	3.4%	3
Assembly buildings	3.8%	3

EVALUATION

In order to achieve the objective of reducing the excess use of land for building purposes, the extent of the land rededication is assessed by determining the previous use of the land on which the building is being built. To limit soil sealing on undeveloped land, achieving a low soil sealing factor and implementing compensatory measures is reflected positively in the evaluation. A circular economy bonus can be earned if the building is built on contaminated land or if considerable work must be undertaken in order to dispose of the original building that is subject to contamination, meaning that the land quality will be significantly improved compared to its previous state. 100 points can be obtained for this criterion; with the bonus, a maximum of 110 points can be awarded.

NO.	INDICATOR	POINTS
1	**Land use**	
1.1	**Extent of rededication**	**0–80**
1.1.1	Outer development area – undeveloped For building purposes, land is used that has already been allocated to the settlement and circulation area by means of the land-use plan and for which there is a legally valid land-use plan. This land has not yet been developed. (“Outer zone” in accordance with the local zoning codes e.g. “zoning ordinances” or “land use ordinances”).	10
1.1.2	Inner development area – undeveloped For building purposes, land is used that is within an existing settlement structure ("Inner area" in accordance with the local zoning codes e.g. “zoning ordinances” or “land use ordinances”).	40
1.1.3	Brownfield For building purposes, brownfield within an existing settlement structure ("Inner area" in accordance with the local zoning codes e.g. “zoning ordinances” or “land use ordinances”).	80
1.1.4	**CIRCULAR ECONOMY BONUS – BROWNFIELD REDEVELOPMENT** Significant improvement of contaminated site Explanation: The existing land is significantly improved if the soil on the plot is properly disposed of, the soil being categorised using either national (local)contaminant classification or classification described in Appendix B, the term contaminated site refers to that site where hazardous substances, as defined in Article 3 of Regulation (EC) No 1272/2008[1], are present in a level that pose a significant risk to the environment and human health, or if building components/building materials from existing building fabric that have been found to be highly contaminated are properly disposed of. Munition can be also considered as a potential hazardous event in the areas with the relevant historical backgrounds (e.g. WWII battlefields).	+10
	Significant improvement of land with low-level contamination as a result of the project	+5
	Significant improvement of land with significant contamination as a result of the project	+10

[1] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

2	**Soil sealing factor and/or compensatory measures**	
2.1	**Soil sealing factor and/or compensatory measures**	**Max. 20**
2.1.1	Soil sealing factor	(+)0–20
	■ The soil sealing factor of the total developed and undeveloped area is more than 80%	0
	■ The soil sealing factor of the total developed and undeveloped area is no more than 50%	20
2.1.2	Implementation of compensatory measures	**+**10

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The soil sealing factor of the total developed and undeveloped area is a good key performance indicator (KPI) to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Soil sealing factor of the total developed and undeveloped area	[%]
KPI 2	Investigation of potentially contaminated sites according to ISO 18400-203:2018 corresponds EU Taxonomy indicator “Pollution prevention and control”	[yes/no]

Synergies with DGNB system applications

- **DGNB DISTRICT:** The soil sealing factor is determined in accordance with the requirements of criterion ENV1.7 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

–

II. Additional explanation

Land is repurposed rather than "consumed". This is generally reflected in the fact that the type and extent of the land cover change. The criterion assesses whether and to what extent the type of land use changes as a result of the project.
In particular, the reuse of land as part of circular flow land use management, as well as urban re-densification, urban infill and other brownfield development measures will be reflected positively in the evaluation.

III. Method

This criterion relates to the building once it is complete. How much land a project uses can generally only be influenced in the project development and design phase. Once the planning application has been submitted and approved, there are no further opportunities to make changes.

Indicator 1.1: Extent of rededication
This only takes into consideration the (building) plot. Land used for extracting raw materials (e.g. quarries) or for production buildings for producing building materials and products is not taken into consideration. To assess the plot of land, its previous use must be determined by consulting land registry records or the cadastre. In addition, previous contamination due to hazardous waste and other legacy contamination, munition, etc. must be checked in existing expert reports.

The following aspects are taken into account when assessing the indicator:

- The land's previous use is determined using excerpts from land registry records or the cadastre.
- Previous contamination of the plot (e.g. due to hazardous waste and other legacy contamination, munition, etc.) is determined using existing expert reports.

The type, scope and direction of the actual change of land use is recorded and assessed using the measurement regulations. When assessing the direction, developing semi-natural land will be reflected negatively in the evaluation, and developing land subject to low-level to significant contamination will be reflected positively in the evaluation.

In addition, measures to develop brownfield sites, as opposed to developing greenfield sites, will be reflected positively in the assessment.

The actual use of the land (in the plot area) is not the same as the developed or impervious/sealed land area. The evaluation is based on the actual use as defined in the cadastre.

Undeveloped land is land for which **greenfield development** measures have already been allocated to the circulation and settlement area by means of a land use plan and for which planning permission exists in the form of a legally valid land-use plan, and that has not yet been developed.

Undeveloped land is also land that has been allocated **brownfield development** measures within an existing settlement structure ("Inner area")and that has not yet been developed. This includes urban infill and re-densification measures.

Developed land is land within an existing settlement structure ("Inner area") that has already been assigned to the category "Building area", "Business operation area" or "Circulation area" and that has previously been in use predominantly as a building, industrial and commercial or circulation area; this type of land includes brownfield sites.

Indicator 1.1.4: Circular economy bonus – brownfield redevelopment (significant improvement of contaminated land)
Brownfield redevelopment is often implemented by making contaminated land suitable for (re)use by means of measures to dispose of contaminated soil and improve the soil categories. Land with a national (local) contaminant classification (if applicable) or there is a suspicion of contamination, either because there is/has been an activity considered to be potentially polluting, or because an accident or spill has occurred, and/or land containing munitions is classed as contaminated. If significant contamination is identified in the inherited building fabric on the land and if this needs to be disposed of, this can also be taken into consideration when evaluating the indicator. Classification as either "Significant improvement of land with low-level contamination as a result of the project" or "Significant improvement of land with significant contamination as a result of the project" depends on the level of contamination (contaminant classification) of the soil or building fabric in the project in question, and on the proportion of land with contaminated areas in relation to the scope of the project as a whole. The soil and contaminant survey must be used as a basis for this classification, and documentary evidence for the disposal must be provided.

Indicator 2.1: Soil sealing factor and compensatory measures
The soil sealing factor of the undeveloped land must be determined. The soil sealing factor is calculated based on the amount of impervious/sealed, developed and undeveloped land as a proportion of the total land area.

Soil sealing factor = (sealed developed and undeveloped land area / total land area) * 100 [%]

The indicator is evaluated on the basis of the available documentation on calculating the soil sealing factor for the developed and undeveloped land. Soil sealing is the artificial separation of the soil from the atmosphere by covering the surface of the soil with materials that are virtually impenetrable to rainwater, especially by building roads, paths and buildings on this land. Sealing can be divided into the following types:

- Full sealing, e.g. with tarmac or concrete,
- Partial sealing, e.g. with flagstones, grass pavers and paving slabs,
- Underground sealing, e.g. by means of underground garages, etc.

The soil sealing factor indicates the proportion of the total land area under consideration that is sealed. The following percentages are to be used for calculations involving partially sealed land:

- Water-bound cover (paths and roads, squares and other large, open plots, entrances and driveways, etc.) 80%,
- Spaced paving with grass jointing and similar ground coverings, drain paving 70%,
- Grass pavers 50%,
- Gravel/stone chippings 40%,
- Lawn on gravel 30%.

Exemption with regarding to sealing:

- If an expert report demonstrates that it is necessary to seal certain areas for ecological reasons (e.g. highly contaminated soil would contaminate the groundwater), these sub-areas can be disregarded.

Crediting compensatory measures:

- Compensatory measures implemented on the plot of land or in the immediate vicinity can be credited in the evaluation. These include all measures normally recognised under building and planning law. They encompass particular rainwater management and infiltration measures, green roofs and walls and landscaping.

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators.

Indicator 1.1: Extent of rededication

- Relevant excerpts from land registry records or the cadastre as evidence of the previous use of the land for building purposes.

Indicator 1.1.4: Circular economy bonus – brownfield redevelopment (significant improvement of contaminated land)

- Documentation of previous contamination of the plot, e.g. in the form of excerpts from the soil survey, contaminant cadastre or a contaminant survey that specifies the level of contamination, waste categories and geographical location (mapping) of the contaminants*, as well as a professional assessment of the contaminated area as a proportion of the project as a whole so that it can be categorised as "low-level" or "significant" contamination. The list of polluting activities varies among countries, depending on their industrial past and the national legislation. Generally the concept of polluting activities refers to certain installations[2] and industrial activities[3] that are damaging the capacity of soil to continue to perform in full its broad variety of crucial functions.

*However, contaminant classification can be defined as follows (if no national soil contamination classification can be applied):

- 0 Natural soil, unrestricted reuse
- 1 Restricted open installation (certain use restrictions, the decisive factor for determining the values is usually the protective material groundwater)
- 2 Restricted reuse with defined technical protection measures for groundwater
- 3 Residential waste, landfill class I
- 4 Residential waste, landfill class II
- 5 Waste, hazardous waste landfill

Parameters	Waste, hazardous waste landfill	Residential waste, landfill class II	Residential waste, landfill class I
Loss on ignition of the dry residue of the original substance	≤ 10 Mass-%	≤ 5 Mass-%	≤ 3 Mass-%
Extractable lipophilic substances of the original substance	≤ 4 Mass-%	≤ 0.8 Mass-%	≤ 0.4 Mass-%
Conductivity	≤ 100,000 µ S/cm	≤ 50,000 µ S/cm	≤ 10,000 µ S/cm
TOC	≤ 200 mg/l	≤ 100 mg/l	≤ 20 mg/l

[2] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), p.23.

[3] Annex II of the proposal Directive of the European Parliament and of The Council establishing a framework for the protection of soil and amending Directive 2004/35/EC.

Phenols	≤ 100 mg/l	≤ 50 mg/l	≤ 0.2 mg/l
Lead	≤ 2 mg/l	≤ 1 mg/l	≤ 0.2 mg/l
Zinc	≤ 10 mg/l	≤ 5 mg/l	≤ 2 mg/l
Cyanide, easily released	≤ 1 mg/l	≤ 0.5 mg/l	≤ 0.1 mg/l
AOX	≤ 3 mg/l	≤ 1.5 mg/l	≤ 0.3 mg/l
Water-soluble fraction	≤ 10 Mass-%	≤ 6 Mass-%	≤ 3 Mass-%

The table lists some selected allocation values, which clearly show the grading of the different landfill classes.

https://www.umweltdaten.landsh.de/nuis/upool/gesamt/jahrbe97/tasi/tasiabfa.htm

* more information regarding the types of soil contamination:

http://ec.europa.eu/environment/integration/research/newsalert/pdf/IR5_en.pdf

Alternatively, Investigation of potentially contaminated sites can be done according to ISO 18400-203:2018 Soil quality-sampling.

Indicator 2.1: Soil sealing factor or compensatory measures

- Calculation of the soil sealing factor of the undeveloped land
- Site plan with information on the land and land cover types
- Documentation of the compensatory measures in question, e.g. in the form of:

approval from the relevant authority for the measures implemented as compensation areas/compensatory measures in accordance with the Habitats Directive (more formally known as Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora).

- Relevant excerpt from the urban land-use plan that demonstrates that approved compensatory measures are in place for the property to be assessed and lists the applicable requirements
- Excerpt from the written text and drawings defining the compensatory measures and used to implement the requirements
- Plans of the compensation areas

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
all	General: scheme “Assembly buildings” has been added	16.09.2021
208	KPI 2: new KPI regarding soil contamination, corresponds EU Taxonomy indicator “Pollution prevention and control”	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org
- The Habitats Directive. http://ec.europa.eu/environment/nature/legislation/habitatsdirective/
- Status of local soil contamination in Europe, A report by the JRC in collaboration with the European Information and Observation Network (Eionet) national reference centres for soil, 2018
- The need for soil protection, legislation at EU level Position paper of the German Environment Agency, October 2018
- Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, December 2018
- Soil hazard categorisation and management, EPA (environmental protection agency US). June 2009
- Federal Soil Conservation Act (Bundes Bodenschutzgesetz) https://www.umweltbundesamt.de/en/topics/soil-agriculture/site-contamination
- Technical instructions for recovery, treatment and other disposal of municipal waste, *Landesportal* Schleswig-Holstein, Ministry of Energy Transition, Agriculture, Environment, Nature and Digitalization. https://www.umweltdaten.landsh.de/nuis/upool/gesamt/jahrbe97/tasi/tasiabfa.htm
- Soil Contamination: Impacts on Human Health, Science for Environment Policy, published by European Commission Issue 5, September 2013
- ISO 18400-203:2018 Soil quality — Sampling — Part 203: Investigation of potentially contaminated sites, October 2018

ENV2.4

Biodiversity at the site

Objective

Our objective is to maintain biodiversity in the local environment. The built environment has a significant influence on the diversity of the ecosystems (ecological communities, habitats and landscapes), the diversity of the species there and their genetic diversity. We want to encourage positive steps towards creating, maintaining and increasing biodiversity both on buildings themselves and in their environs.

Benefits

People generally feel happier and healthier when they are in a natural environment. Subjective well-being has an enormous effect on people's health and on what they can achieve. Furthermore, plants in, on and around the building and respect for the local fauna create a positive image of the building. This increases value of the property. In addition, choosing plants that are suitable for the site can reduce subsequent costs as these are often hardier, less susceptible to disease etc., and require less care.

Contribution to high-priority sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	15.5	Natural habitats	15.1	Biodiversity
Moderate	13.1 15.8 15.9	Resilience and adaptability Invasive species Ecosystem and biodiversity values in decision-making processes		
Low	11.5	Impact of catastrophes		

Outlook

Adapted to the DGNB scheme for districts, this criterion is being applied to buildings for the first time in the 2018 version. For a long time now, the considerable importance of biodiversity has required a pragmatic approach. Our short-term objective is to re-examine the methodology and increase acceptance of this issue. In the medium term, we plan to add further, relevant indicators to the methodology that are conducive to achieving our goal.

Share of total score

	SHARE	RELEVANCE FACTOR
Office Education Residential Hotel	1.2%	1
Consumer market Department stores		
Logistics Production		
Shopping centre	1.1%	1
Assembly buildings	1.3%	1

EVALUATION

In order to maintain the diversity of ecosystems, indicator 1 provides information on identifying "biotope area quality". An Excel tool is available for calculating this. In order to foster diversity amongst animal species, measures implemented to support this in indicators 2 and 3 will be reflected positively in the assessment. Indicator 4 plays a key role in maintaining the genetic diversity of flora. If ecosystems are interlinked or facilitate the travel or migration of animals from one area to another, this can be made clear using indicator 5. Finally, fulfilling indicator 6, "Development and maintenance care", demonstrates that a long-term commitment to cultivating the area has been honoured. 110 points can be obtained for this criterion, of which a maximum of 100 points can be awarded for just fulfilling the criterion. The additional 10 points can be obtained by earning an "Agenda 2030 bonus". Including the bonus, a maximum of 110 points can be awarded for this criterion.

NO.	INDICATOR	POINTS
1	**Biotope area quality**	
1.1	**Biodiversity index** Property-specific biodiversity index = (total (sub-areas * specific biodiversity indices) * (floor space index) / (plot area)) ■ Property-specific biodiversity index = 0.25 ■ Property-specific biodiversity index ≤ 0	**0–30** 30 0
1.2	**AGENDA 2030 BONUS – CLIMATE AND SPECIES PROTECTION GOALS** Green surfaces on the building: Property-specific biodiversity index > 0.25 (for every 0.015 whole number above this figure +1 bonus point, max. bonus points = 10)	**+10**
2	**Diversity of animal species in the outdoor area**	
2.1	**Specific measures for the active introduction of new and native animal species in the outdoor area** Measures to encourage and support existing species and introduce new and native animal species in the outdoor area have been and will be implemented as part of the building project on the plot of land covered by the project or in its immediate vicinity as part of the construction measure.	**20**
3	**Diversity of animal species on the building itself**	
3.1	**Specific measures for the active introduction of new and native animal species on the building** Measures to encourage and support existing species and introduce new and native animal species on the building itself (e.g. nesting boxes, beehives, bird protection glass, etc.) have been and will be implemented as part of the project.	**20**
4	**Invasive plant species**	
4.1	**Avoidance of invasive plant species** No invasive plant species (in accordance with the table in Appendix A, indicator 4) are planted on the land as part of the building project.	**10**

NO.	INDICATOR	POINTS
5	**Habitat connectivity**	
5.1	**Measures for habitat connectivity** An evaluation has been carried out with regard to the impact of the project and whether it disrupts or improves links between surrounding biotopes or the movement of animals between areas. Where disruption as a result of the project has been anticipated, measures have been put in place to mitigate the disruption or to interlink areas.	**10**
6	**Development and maintenance care**	**Max. 10**
6.1	**Development agreement** Once work has been completed to satisfy the initial-maintenance provisions, the outdoor area is tended for a further, limited period (generally 1 to 2 years) to encourage the growth of vegetation.	+5
6.2	**Maintenance care** The outdoor area is tended to ensure that it remains operational and to maintain the environmental quality as part of the maintenance provisions. A contractually agreed inspection takes place once a year.	+5
7	**Biodiversity strategy**	
7.1	**Devising and implementing a biodiversity strategy** A comprehensive, long-term biodiversity strategy that goes beyond the measures stipulated in the land-use plan or planning permit and provides for future site development is devised and implemented for the building and its immediate environs.	**10**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The biodiversity index calculated in indicator 1 and information on whether or not invasive plant species are to be planted are good key performance indicators (KPIs) to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Property-specific biodiversity index	[-]
KPI 2	Planting of invasive plant species	Yes/no

Synergies with DGNB system applications

- **DGNB DISTRICT:** Indicators 1, 2, 4 and 5 correspond to the content of criterion ENV1.4, indicators 2, 1, 4 and 3 from the schemes for urban districts, and business districts (Version 2016) and to indicators 1.4.1 and 1.4.2 from the scheme for industrial locations..

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

A decline in biodiversity can be observed the world over. This puts the very foundation of human existence at risk because this loss is irreversible (*cf. BMU 2007*). To counteract this, for example, at the 1992 UN summit in Rio de Janeiro, international objectives for maintaining and increasing biodiversity were agreed, and these objectives are now to be implemented at local level (cf. UN 1992).

Demonstrating respect for nature by catering for biodiversity at the local development site projects a positive image, both externally to customers and visitors and internally to employees. Well-being is demonstrably enhanced by being in healthy, natural environments, which in turn benefits people's overall health.

Even in an urban context, biodiversity can be maintained or nurtured through appropriate measures to the extent that, in the urban environment, greater biodiversity can potentially be achieved than, for example, in mono-structural landscapes or rural areas with very little arable land that could be useful for this purpose. A strategic, environmentally friendly urbanisation concept can be used to integrate landscaping and architecture, e.g. in the form of green roof landscaping, new façade greening systems, realistic water features and small-scale urban farming, combining contemporary design, necessary utilisation and the development and protection of biotopes.

II. Additional explanation

–

III. Method

The indicators are evaluated on a partly qualitative, partly quantitative basis. Firstly, the overall ecological quality of the plot/project area is assessed using a biodiversity index; secondly, the introduction of new species for which evidence can be produced to the effect that these species were not previously present in the area, plus the avoidance of invasive species, are evaluated.

Indicator 1: Biotope area quality
The overall ecological quality of the project area is to be assessed. This evaluation is to be conducted on the individual sub-areas of the project area and their biological quality. For this purpose, a factor is assigned to each sub-area depending on its biological quality (see "Biodiversity indices" table below). For example, a fully tarmacked area is assigned a factor of 0, and a natural water area is assigned a factor of 1.0. Vertical greening and green roofs are also included in the evaluation. The property-specific biodiversity index could therefore theoretically also be higher than 1.0.

The biodiversity index is the sum of the project area's sub-areas multiplied by the specific factor, as a proportion of the total plot area, which is rated using the site occupancy index.

If a qualified expert demonstrates that the environmental quality of an area of land merits a higher rating than that specified in Table 1, a new factor can be recorded for this area. For example, this may be the case if high-risk species have become established on an area of land.

Information with regard to the evaluation

The points for the indicator can be calculated using the following equation:
Property-specific biodiversity index = (total (sub-areas * specific biodiversity indices) * (floor space index) / (plot area))

Building activities (sealing, etc.) reduce the possible environmental quality of an area of land. For this reason, a correction factor is introduced in the form of the floor space index (fsi), depending on the specific development area. The floor space index (fsi) is generally defined in the national (local) land-use plan. If there is no land-use plan, this must be done by determining what area category the plot of land belongs to; see Table 5: Site occupancy index).

Tables 1–4: Biodiversity indices for sub-areas

NO.	DESCRIPTION	FACTOR
1.	**Sealed or partially sealed land**	
1.1	Sealed land Land cover impervious to air and water; no vegetative cover E.g. concrete, tarmac, slabs with a bound foundation	0
1.2	Partially sealed land Land cover impervious to air and water; generally no vegetative cover E.g. clinker, crazy paving, slabs with a sand/gravel foundation, water-bound covers, gravel surfaces, sand surfaces, grass pavers, spaced paving with grass jointing	0.3
1.3	Semi-open land or land cover permeable to air and water; infiltration, vegetative cover; e.g. lawns on gravel, wood-block paving	0.5

NO.	DESCRIPTION	FACTOR
2.	**Green spaces**	
2.1	Vegetation areas separate from the ground Vegetation areas on ground fill that is less than 80 cm deep	0.5
2.2	Vegetation areas separate from the ground Vegetation areas on ground fill that is more than 80 cm deep	0.7
2.3	Vegetation areas contiguous with the ground Vegetation contiguous with the adjacent ground, available for developing flora and fauna	1.0

NO.	DESCRIPTION	FACTOR
3.	**Green space on buildings**	
3.1	Roof greening Extensive or intensive greening of roof surfaces	0.7
3.2	Vertical greening, up to a max. height of 10 m Greening external walls; the real height up to max. 10 m is included	0.5

NO.	DESCRIPTION	FACTOR
4.	**Other**	
4.1	Rainwater infiltration per m² of roof surface area	0.2

Table 5: Site occupancy index

NO.	DESCRIPTION	FACTOR
1.	**Development area**	
1.1	Small housing development area	0.2
1.2	Exclusively residential area, general residential area, holiday area	0.4
1.3	Special residential area	0.6
1.4	Village area, mixed-use area	0.6
1.5	Town or city centre	1.0
1.6	Commercial area, industrial area, other special areas	0.8
1.7	Weekend home area	0.2

Indicator 1.2: Agenda 2030 bonus – climate protection goals
This is awarded if the biodiversity index result is more than the maximum possible number of evaluation points. 1 bonus point can be awarded for every whole number above this figure (a maximum of 10 bonus points can be awarded).

Indicator 2: Diversity of animal species in the outdoor area
The protection of existing animal species and the introduction of new, native animal species for which evidence can be produced to the effect that these species were not previously present in the area, are evaluated. Only measures that are implemented within or in the immediate vicinity of the project area are assessed. The active introduction of new species is intended to increase rather than just maintain biodiversity in the long term.
Species from the following genera can be selected:

- Birds, bats
- Butterflies, wild bees, wasps
- Amphibians, reptiles

A plan must be submitted for the selected species. This plan describes the critical site factors for the life stages "breeding/rearing", "food/sleeping place", "hibernation" and "courtship/mating phase", and their integration into the district. Following the principles of "Animal-aided design" (cf. Hauck, Weisser 2015), it is necessary to integrate the needs of the new animals into open space planning right from the very start. If animals become part of the draft design in this way, they not only inspire the design, but also make it better.
In order to earn the evaluation points, a binding statement must be made to the effect that the measures are not listed in the environmental report or land-use plan of an environmental impact assessment (EIA) or strategic

environmental assessment (SEA).

Indicator 3: Diversity of animal species on the building itself
Like indicator 2, except that only measures that are implemented on the building itself will be reflected positively in the assessment.

Indicator 4: Invasive plant species
The presence of invasive plant species in the district may have a continuous negative influence on environmental quality. "The intentional importation and unintentional introduction of invasive species are regarded throughout the world as the second largest cause of danger to biological diversity after the destruction of habitats" (*cf. BMU 11/2010*).
Evidence must be provided to the effect that the planning area/plot of land does not contain any invasive plant species included in the list of the main invasive and potentially invasive plant species that are used as ornamental plants or shrubs (see below and together with Regulation (EU) No 1143/2014 of the European Parliament of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species). The list was taken from the biodiversity criterion of the German BNB system for the evaluation of outdoor facilities *[BNB-System zur Bewertung von Außenanlagen,]* (*cf. BMUB 2010*). If invasive species are localised, a plan of action for combating them must be formulated, or proof must be provided to the effect that combating them has no prospect of success.

Table 6: Recommended courses of action with regard to invasive plant species[1]

ENGLISH NAME (BOTANICAL NAME)	RECOMMENDED COURSE OF ACTION
Box elder (Acer negundo)	Do not plant near bodies of water or pastureland. Plant at least 2 km away from bodies of water.
Tree of heaven (Ailanthus altissima)	Do not grow on open land. In residential areas, use must be justified by on-site conditions, e.g. drought resistance for highly urban sites where water is likely to be in scarce supply; evidence must be provided that measures have been taken to prevent their propagation (by means of vegetative reproduction or seeds).
Bastard indigo (Amorpha fruticosa)	Do not grow on open land. Plant at least 2 km away from bodies of water in residential areas.
Butterfly bush (Buddleja davidii)	Do not grow on open land.
Turkish warty-cabbage (Bunias orientalis)	Do not use as a herb (Bunias orientalis has no value as an ornamental plant).
New Zealand pygmyweed (Crassula helmsii)	Do not use.
Glandular globe thistle (Echinops sphaerocephalus)	Do not grow on open land.

[1] List of invasive plant species have to be adapted to the local conditions

Canadian pondweed (Elodea canadensis)	Use only in fenced-off water gardens/ponds. Plant at least 2 km away from bodies of water; planting any closer must be justified.
Nuttall's waterweed (Elodea nuttallii)	Use only in fenced-off water gardens/ponds. Plant at least 2 km away from bodies of water; planting any closer must be justified.
Common Japanese knotweed (Fallopia japonica)	Do not use.
Giant knotweed (Fallopia sachalinensis)	Do not use.
Bohemian knotweed (Fallopia x bohemica)	Do not use.
Red ash (Fraxinus pennsylvanica)	Do not grow on open land.
Jerusalem artichoke (Helianthus tuberosus)	Do not use if it is not possible to plant at least 2 km away from bodies of water.
Giant hogweed (Heracleum mantegazzianum)	Do not use.
Floating pennywort (Hydrocotyle ranunculoides)	Do not use.
Himalayan balsam (Impatiens glandulifera)	Do not use.
Small balsam (Impatiens parviflora)	Do not use.
Garden lupin (Lupinus polyphyllus)	Do not sow on open land or on the outskirts of residential areas (alternatively, sterile varieties can be used).
Goji berry plant (Lycium barbarum)	Do not grow on open land.
Yellow skunk cabbage (Lysichiton americanus)	Do not use.
Black pine (Pinus nigra)	Do not grow on open land. Do not grow on or in the area around calcareous grassland.
Weymouth pine (Pinus strobus)	Do not grow on open land. Do not grow within a 300 m radius of rocky areas that require preservation.
Carolina poplar	Do not grow on open land. Do not grow near naturally occurring

(Populus x canadensis)	black poplar trees.
Black cherry (Prunus serotina)	Do not grow on open land. Do not grow in the area around open land biotopes.
Common Douglas fir (Pseudotsuga menziesii)	Do not grow on open land. Plant at least 2 km away from shallow, nutrient-poor rocky ridges or 'blockfields' (e.g. colourful sandstone from the Black Forest and the Odenwald), silver birch and common oak tree forests, sessile oak tree forests and dry, acidic silicate sites.
Red oak (Quercus rubra)	Do not grow on open land. Plant at least 2 km away from rocky biotopes.
Stag's horn sumac (Rhus hirta)	Do not grow on open land or on the outskirts of residential areas.
False acacia (Robinia pseudoacacia)	Do not grow on open land. Plant at least 500 m away from xeric grassland communities that need to be preserved.
Japanese rose (Rosa rugosa)	Do not grow on open land. Do not plant near the coast (even in residential areas).
Armenian blackberry (Rubus armeniacus)	Do not grow on open land. Plant at least 500 m away from oligotrophic grassland and semi-xeric grassland communities that need to be preserved.
Narrow-leaved ragwort (Senecio inaequidens)	Do not use.
Canadian goldenrod (Solidago canadensis)	Do not use.
Late goldenrod (Solidago gigantea)	Do not use.
Common snowberry (Symphoricarpos albus)	Do not grow on open land, near rough pasture or as roadside greenery.
American blueberry hybrid (Vaccinium angustifolium x corymbosum)	Do not grow on open land. Plant at least 3 km away from moorland.

Indicator 5: Habitat connectivity

A combination of soil sealing and urban expansion has shrunk and fragmented the habitats of many species of plant and animal. The few remaining habitats that play host to wild flora and fauna are becoming isolated, preventing genetic exchange between populations. To counter this, biotopes must be interlinked.
The assessment will evaluate whether the land features sufficiently effective biotope interlinking elements. The size and distribution of these elements must be defined using a biotope land-use plan with a biotope function map.

Definitions of interlinking:

- An area is regarded as being "interlinked" if it is connected by a sufficiently wide interlinking corridor to another open space. (Areas can also be considered interlinked if evidence is provided that what are referred to as "stepping-stone biotopes" are sufficient for the migration and travel of animals and for the exchange of species between areas.)
  If there is no interlinking for certain species (for example due to a busy road), measures (green bridge, frog tunnel, etc.) must be demonstrated that link the existing species inside the project area with those outside in order to include these areas in the evaluation. The usefulness of these measures must be confirmed by a qualified expert (this may also take place as part of the EIA). This applies to roads if they are wider than 3.5 metres.

Indicator 6: Development and maintenance care

- Monitoring, maintaining and adapting the measures in question is also important. The assessment will look into whether an upkeep agreement with a specialist firm is going to be drawn up, which defines the nature of the upkeep provisions, as well as the number of upkeep tasks and the frequency with which they are to be to be carried out. Development provisions in accordance with national (local) management and maintenance plan which are to be carried out once work has been completed to satisfy the initial-maintenance provisions, and are designed to ensure that the outdoor facilities become operational.
- Maintenance provisions in accordance with national (local) management and maintenance plan are to be carried out once work has been completed to satisfy the development provisions, and are designed to ensure that the outdoor facilities remain operational.

Indicator 7: Biodiversity strategy

- A comprehensive, long-term biodiversity strategy that goes beyond the measures stipulated in the land-use plan or planning permit and provides for future site development is devised and implemented for the building and its immediate environs. A clear definition of the target development state must be provided, and there must be a yearly inspection of the progress made, after which any necessary changes must be implemented.

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators.

Indicator 1: Biotope area quality

- Brief explanation, photos of the implemented measures and, if necessary, mapping in an overall plan
- Site plan, urban design concept and aerial photograph
- Categorisation of the areas in the project area and their designation on an overall plan. Calculation of the biodiversity index using the Excel tool provided. Clear declarations of intent are necessary for areas for which there is still no open space plan and for façade surfaces.

Indicator 2: Diversity of animal species in the outdoor areas
and
Indicator 3: Diversity of animal species on the building itself

- Concept within the framework of "Animal-aided design“ demonstrating how the needs of the new animals are integrated into open space planning right from the very start
- Presentation of the planned and/or implemented measures for introducing new and native species.
- Evidence that the chosen species have integrated into the area (taking critical site factors into consideration).
- Statement by (by a qualified expert) that the land does not contain any invasive species in accordance with Appendix 1 – in the event that it does, however, a mandatory plan of action for combating these invasive species must be formulated.

Indicator 4: Avoidance of invasive plant species

- Statement by a (qualified) expert that the land does not contain any invasive species in accordance with Table 6 and with the Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species. In the event that it does, however, a mandatory plan of action for combating these invasive species must be formulated.

Indicator 5: Habitat connectivity and movement areas

- Site plan, urban design concept and aerial photograph
- Brief explanation, photos of the implemented measures and, if necessary, mapping in an overall plan
- Statement by a qualified expert on how interlinking between ecologically relevant open spaces for certain species is to be achieved (stepping-stone biotopes, migration tunnel, green bridges or similar crossing aids)

Indicator 6: Development and maintenance care

- Excerpt from the concluded development and upkeep agreement

Indicator 7: Biodiversity strategy

- Excerpt from the finalised biodiversity strategy

APPENDIX C – LITERATURE

I. Version

Change log based on 2018 version

PAGE	EXPLANATION	DATE
all	General: scheme “Assembly buildings” has been added	16.09.2021

II. Literature

- Bundesamt für Naturschutz [German Federal Agency for Nature Conservation]. Informationsblatt über den Handel mit Holz geschützter Arten innerhalb der Europäischen Union (EU) [Information sheet on trading protected wood species within the European Union (EU)]
- Bundesamt für Naturschutz [German Federal Agency for Nature Conservation]. Information from the Bundesamt für Naturschutz. Liste der im WA und der VO(EG) Nr. 338/97 geschützten Holzarten [List of wood species protected by the CITES and Council Regulation (EC) No. 338/97]. February 2012
- Bundesamt für Naturschutz [German Federal Agency for Nature Conservation]. Information from the Bundesamt für Naturschutz. Holzverbote [Wood bans]. April 2011
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Economic quality

The three criteria of economic quality serve to assess the **long-term economic viability** (life cycle costs) and **economic development**.

ECO1.1	Life cycle cost
ECO2.1	Flexibility and adaptability
ECO2.2	Commercial viability

ECO1.1

Life cycle cost

Objective

Our objective is sensible and conscious use of economic resources throughout the entire life cycle of a building. In the conception and planning phases of implementation of a building, there are areas of significant optimisation potential for later economic management. The parties involved in the planning process should regularly focus on possible follow-up costs associated with their design and implementation variants from an early stage in the planning phases.

Benefits

In addition to yields from the production and exploitation costs, the economic viability of a building depends on cost-efficient operation. To this end, the life cycle cost calculation enables the medium-term to long-term costs of a building to be taken into account. Carrying out the life cycle cost calculations and communicating them to the parties involved in planning more regularly and earlier in the planning process increases the likelihood of achieving solutions optimised for cost-efficiency in the long term. This method can also serve as a basis for determining a transparent cost comparison for buildings with similar usage and functionality, which can be used as a guide for the performance of the project under development. For this step, the life cycle cost calculation is performed on the basis of fixed parameters in accordance with defined conventions, and can then be used comparative assessment using appropriate benchmarks.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Moderate	7.1	Access to modern energy services	7.1.a/b	Resource conservation
			11.3	Residential
	7.3	Energy efficiency		
	12.2	Use of natural resources		
Low	1.1	Eliminating extreme poverty	1.1.a/b	Poverty
	1.2	Halving poverty		

Outlook

The current version of the criterion emphasises the importance of continuous monitoring of life cycle costs and assessment of variants at various points during the planning process in order to achieve cost-efficient buildings, and new indicators have been introduced to that end. The comparison calculation for the life cycle costs continues to be an essential instrument for providing the project team with guidance concerning how well their project compares to others.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Assembly buildings	10.0%	4
Production	12.9%	4

EVALUATION

Regular checking of the life cycle costs for the current planning status throughout the entire planning process is acknowledged via indicator 1. The development and analysis of the life cycle costs of variants is evaluated via indicator 2. If the life cycle costs are determined in accordance with a fixed method and compared to a comparison value (benchmark), a result that moderately exceeds or, where appropriate, falls below the benchmark value can – depending on the level of deviation from the comparison value – be incorporated positively into the evaluation in indicator 3. A maximum of 80 points can be achieved in this indicator. A circular economy bonus can be incorporated into the evaluation with a maximum of 10 points (5 points per implemented solution). Without a bonus, a maximum of 100 points can be achieved, or a maximum of 110 points with bonuses (this also applies to consumer markets including possible additional points). The point distribution for **Assembly buildings** is differentiates from the other schemes due to the limited data for benchmark establishment.

NO.	INDICATOR	POINTS
1	**Calculations of the life cycle costs in the planning process**	
1.1	**Integration of calculations of the life cycle costs into the planning process**	**Max. 10**
	Assembly buildings	**Max. 20**
1.1.1	A life cycle costs system/ model is drawn up for the project in an early planning phase. The building variants included in the planning phase are compared with regard to their production costs and relevant follow-up costs, at minimum including the expected energy costs.	+5
	Assembly buildings	+10
1.1.2	The life cycle costs are determined at regular intervals during the planning process (adjusted to match the relevant planning status) and are communicated within the planning team. All relevant building-related follow-up costs are fully integrated into the calculations in HOAI service phase 4 at the latest. (HOAI - Official Scale of Fees for Services by Architects and Engineers. The service phases described under the chapter “terms and definitions” (T&D_01) of the document “Evaluation and structure of the DGNB system)	+5
	Assembly buildings	+10
2	**Life cycle cost optimisation**	
2.1	**Life cycle cost optimisation during the planning process**	**Max. 10**
	Assembly buildings	**Max. 20**
2.1.1	The effects of significant alternative decisions on the expected life cycle costs are determined for the building. This process is carried out as an extensive full consideration of the entire building.	**+ Max. 7**
	Assembly buildings	**+ Max. 14**
	■ Per alternative as part of a full consideration within the scope of service phase 2, service phase 3 or service phase 4	+3
	Assembly buildings	+6
	■ Per alternative as part of a full consideration within the scope of service phase 5, service phase 6 or service phase 7	+2
	Assembly buildings	+4
2.1.2	The effects of significant decisions on the expected life cycle costs are determined for the	**+ Max. 3**

building. This process is carried out as a partial analysis (section) for the relevant building components and follow-up costs.

Assembly buildings	**Max. 6**
■ Per alternative as part of a partial analysis within the scope of service phase 2, service phase 3 or service phase 4	+2
Assembly buildings	+4
■ Per alternative as part of a partial analysis within the scope of service phase 5, service phase 6 or service phase 7	+1
Assembly buildings	+2

	INNOVATION AREA	**Same as 2.1**
Re 2.1	Explanation: Alternative approaches that achieve optimisation of the life cycle costs can also be selected and credited.	
2.2	**CIRCULAR ECONOMY BONUS – REUSE** Explanation: If a significant portion of the relevant reference value of components is demonstrably reused or implemented in or on the building via business models that conform to the circular/sharing economy concept and ensure or significantly support recyclability, the bonus can be awarded (e.g. performance contracting with recovery or reuse strategy). For each circular economy solution implemented, 5 bonus points can be awarded.	**+ Max. 10** +5

NO.	CATEGORY 1	CATEGORY 2	CATEGORY 3	POINTS
3	**Building-related life cycle costs**			
3.1	**Assessment and comparison of the building-related life cycle costs** Costs are given as a net value per m² of gross floor area EUR/m²GFA$_S$ for selected structural and technical components in accordance with Appendix 1, for selected occupancy costs i.e. selected operation costs (supply and disposal, cleaning, energy consumption, operation, inspection, and maintenance) and selected maintenance costs (for details, see Appendix 2 and 3) based on a reference period of 50 years (**Logistics** and **Production** = 20 years). All specifications (if not marked separately) in EUR/m²GFA$_S$ (gross floor area "standard case" in accordance with the T&D_04).			
	Office **Education** **Residential** **Shopping centre** **Department stores** **Logistics** **Production** **Hotel**			**10–80**
	Assembly buildings			**10–60**
	Consumer market			**10–90**
3.1.1	**Office**	**Office buildings – medium standard**	**Office buildings – buildings with increased representativeness requirements**	**10–80**
	≤ 6447	≤ 6755		10
	≤ 5033	≤ 5536		40
	≤ 3661	≤ 4164		80
3.1.2	**Education**	**Day care**	**Schools**	**Institutional buildings**	**10–80**

		facilities/kindergartens			
		≤ 6477	≤ 6700	≤ 8255	10
		≤ 4986	≤ 5164	≤ 6578	40
		≤ 3815	≤ 3992	≤ 5406	80
3.1.3	**Residential**	**Residential buildings (at least 6 residential units)**			**10–80**
		≤ 5660			10
		≤ 4239			40
		≤ 3093			80
NO.		**CATEGORY 1**	**CATEGORY 2**	**CATEGORY 3**	**POINTS**
3.1.4	**Consumer market**	**Retail/ supermarket**			**+ (10–80)**
		≤ 4589			10
		≤ 3614			40
		≤ 2471			80
		Additional points that can be awarded when using refrigerated counters: Annual energy consumption per linear metre of refrigerated counter			**+ (1–10)**
		≤ 3000 kWh/linear metre			1
		≤ 1200 kWh/linear metre			10
3.1.5	**Shopping centre**	**Shopping centre**			**10–80**
		≤ 7040			10
		≤ 5373			40
		≤ 3807			80
3.1.6	**Department stores**	**Retail parks**	**Department stores**		**10–80**
		≤ 5311	≤ 6476		10
		≤ 4096	≤ 5155		40
		≤ 3020	≤ 4079		80
3.1.7	**Logistics Production**	**Warehouses/logistics/ Production facilities with low requirements**	**Production facilities with increased requirements**		**10–80**
		≤ 2577	≤ 2718		10
		≤ 2004	≤ 2121		40
		≤ 1629	≤ 1747		80
	Alternatively :	**Warehouses/logistics/ Production facilities with low requirements in €/m²GV (Gross Volume)**	**Production facilities with increased requirements in €/m²GV (Gross Volume)**		

		≤ 258	≤ 272	10
		≤ 200	≤ 212	40
		≤ 163	≤ 175	80
3.1.8	**Hotel**	**Hotel – standard (0–3 stars)**	**Hotel – upscale (4 or more stars)**	**10–80**
		≤ 9809	≤ 12,041	10
		≤ 7483	≤ 9156	40
		≤ 4449	≤ 5477	80
3.1.9	**Assembly buildings**	**Assembly buildings**		**10–60**
		≤ 10563		10
		≤ 6670		30
		≤ 4609		60

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The life cycle cost value in accordance with the DGNB method can be communicated as key performance indicators (KPIs).
The LCC results and calculation basis can also be used for reporting in accordance with the "Level(s) – Common EU framework of core environmental indicators" (additional information regarding the EU framework is under the T&D_02).

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Building-related life cycle costs in accordance with the DGNB, corresponds to Level(s) indicator 6.1 "Life cycle costs" (simplified reporting option) Note 1: If the detailed assessment is carried out and the disposal costs are also calculated, the reporting corresponds to the "non-simplified" option. Note 2: In addition to the DGNB requirements, in accordance with Level(s), the expected servicing and repair costs must also be specified as irregular payments in addition to the regular payments. Note 3: The data sources must be specified in detail in accordance with Level(s) for all life cycle modules and elements in accordance with the defined method. Note 4: Information regarding the conventions for the calculation can be taken directly from the LCC method (e.g. discount rates, reference period)	[EUR/m² GFA*a]

Synergies with DGNB system applications

- **DGNB BUILDINGS IN USE:** The result of indicator 3.1 can be used as a basis for comparison in criterion ECO9.1 from the scheme for buildings in use.
- **DGNB RENOVATED BUILDINGS:** The calculation model and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 from the scheme for renovated buildings.
- **DGNB DISTRICTS**: Certain input values and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 from the schemes for urban districts, industrial sites and business districts.
- **DGNB INTERIORS:** The calculation model and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 from the scheme for interiors.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

In addition to yields on the manufacturing and exploitation costs, the economic viability of a building depends on cost-efficient operation. To this end, the life cycle cost calculation enables the medium-term to long-term costs of a building to be taken into account. These figures can be used as a basis for a transparent cost comparison for buildings with similar usage and functionality in order to carry out further analyses and optimisation. The calculation is carried out in accordance with fixed parameters and implements a comparative assessment on the basis of benchmarks.

II. Additional explanation

Life cycle cost planning carried out alongside the process can be used to identify cost drivers as well as win-win solutions (e.g. measures that are worthwhile for both environmental reasons and economic reasons). This enables a life cycle cost calculation to contribute to a balanced analysis of measures across various topics in the DGNB certification system. Options and alternatives are examined in terms of their short-term, medium-term and long-term cost-efficiency and thereby potentially contribute to strengthening the economic viability of the building.

The life cycle costs normally include all costs that arise throughout the lifetime of a building:

- Construction or (initial) investment costs: Costs incurred in the production phase (costs for planning and implementation).
- Follow-up costs or selected operation costs: Property management, operation and repair costs.
- Recovery costs: Costs for demolition, dismantling, recycling and disposal (due to use of the net present value method, these costs currently make up an insignificant portion of the life cycle costs and are therefore not taken into account in the comparison costs method (indicator 3)).

The life cycle costs are organised by cost types, as this is the only way to enable replacement cycles for components and maintenance to be taken into account.

III. Method

Indicator 1: Calculations of the life cycle costs in the planning process
The objective of indicator 1.1 is to clearly present the complete life cycle costs from an early planning phase, tailored to the specific context or the point in time and planning scope.

An LCC model should be drawn up in an early planning phase (service phase 2–3). The most likely/preferred building variants included are compared with regard to their production costs and relevant follow-up costs, at minimum including the expected energy costs.

In addition, points can be included in the evaluation if an LCC model is created in service phase 4 and used for evaluation, containing the following follow-up costs at a minimum ("all relevant building-related follow-up costs"):

- Supply and disposal costs (water, fuels, energy, waste water)
- Cleaning costs
- Servicing and maintenance costs
- Repair costs

From service phase 4 onwards, the assessment of the life cycle costs should contain the scope of follow-up costs shown above. Additional building-related or use-related follow-up costs or expected yields can also be included in the assessment, such as recycling costs, conversion costs, revenues and personnel costs. This method can also take into account aspects that are not part of the DGNB calculation scope in accordance with indicator 3, such as the inclusion of exterior spaces or other cost types. It is likewise possible to factor conventions into the assessments, such as interest rates.

For assessment during the planning process and communication of the life cycle costs to the planning team, target values (tailored to the planning status) must be defined that are compared to the achieved values in various planning phases.

In principle, the calculation method can be freely chosen, but it should fulfil the objectives of the sub-indicators. At the very beginning of the planning process, simple tools can be selected depending on their use, such as the multiple of yearly rents (the "*Maklermethode*" or "estate agent's method"), as a starting point for calculation of yield properties with a combination of the energy costs.

Indicator 2: Life cycle cost optimisation
The objective of planning optimised for life cycle costs is to address the follow-up costs as early as possible in the planning process and to reduce or optimise them via variant calculations. Planning optimised for life cycle costs should be carried out at various suitable points in time.

Alternatively, full considerations (life cycle costs for the entire building in accordance with the scope of analysis of indicator 3 and the minimum scope of follow-up costs specified in indicator 1) or partial analyses (life cycle costs for a section of the scope of analysis) can be incorporated into the evaluation.

Optimisations should investigate the life cycle costs of significant alternatives for relevant decisions. Depending on the planning phase, these can vary greatly and affect aspects such as variants of the A/V ratio, duration of use of planned components or the use of operating materials.

Aspects that are not part of the scope of analysis of the "cost comparison" can also be taken into account for calculating variants in the life cycle costs (see indicator 3). This includes taking other cost types (external installations

or equipment), other energy consumers (such as lifts and user equipment), operating materials (such as refrigerants) or conversion, replacement or modernisation costs into account, for example. An expanded scope of analysis can also include the assessment of possible yields (including yields relating to personnel or customers) or cost reductions relating to personnel, such as intelligent planning of future conversion measures. Conventions that differ from the cost comparison defined below (see indicator 3), such as interest rates, rates of price increases, etc., can also be factored into the alternatives.

The findings of the planning optimised for life cycle costs should be incorporated into the decision-making process.

The number of alternatives for which comprehensive or partial calculations of the life cycle costs were carried out in early or later planning phases is evaluated.

Indicator 2.2: Circular economy bonus – reuse
If a significant portion of the relevant reference value (at least 80%, based on the relevant building components (on sub-level) according to Appendix 1) of components is demonstrably reused or implemented in or on the building via business models that conform to the circular/sharing economy concept and ensure or significantly support recyclability, a circular economy bonus can be awarded (e.g. performance contracting with recovery or reuse strategy). If more than one solution is implemented, these should, if possible, be in different components (on the sub-level) or be significantly different from one another.

Indicator 3: Building-related life cycle costs
The assessment method corresponds to the explanations of ISO 15686-5:2008. In order to establish a consistent method for the DGNB documentation, there are additional specifications based on the content of the standard.

The following building components are incorporated into the assessment of the life cycle costs and the evaluation in this criterion:

Selected production costs in accordance with Appendix 1 (general description is also under the T&D_05)

- Structural Components – construction works
- Technical Components – services (in accordance with Appendix 3)

Selected operation costs in accordance with Appendix 2, 3 and 4

- Supply and disposal costs
  - Water
  - Fuels, energy
  - Sewerage
- Cleaning and maintenance of buildings
- Operation, inspection, servicing
  - Inspection and servicing of the structures
  - Inspection and servicing of the installations
- Repair costs
  - Structural repairs
  - Repair of the installations

Other costs, including the cost of the plot, planning costs, capital costs, taxes, insurance and costs for demolition and disposal of the building, are not currently included in the evaluation of the indicator.

Net present value (NPV) method

The life cycle costs that occur as a result of the production and operation costs, distributed across a specified time frame, are capitalised over the year of certification and expressed as a net present value. The net present value method enables different cost/time progressions to be compared to one another. This makes it possible to weigh up initial expenditures and later follow-up costs or even savings. Application of the net present value method requires both the details of costs and information regarding the payment date. This method takes into account both price developments (price increases) and the effective interest rate.

The net present value represents the current capital value of the costs accumulated during the reference period.

The cost levels of the benchmarks are defined as a reference point for the certification.

The effective interest rate is specified by the DGNB. This expresses the expected returns for the capital invested, which incorporates inflation and the risk of the investment, among other aspects.

Conventions

The life cycle cost assessment is fundamentally open-ended and can be adjusted to suit the application situation in many places. However, a requirement for using the application as an indicator to evaluate the determined parameters as part of benchmarking is that the method is precisely defined and that a wide range of parameters are explicitly specified. This is the only way to ensure that the calculation results can be compared, which is an absolute requirement.

Conventions concern the following points:

- Reference period
- Life cycle phases
- Building components included
- Calculations included
- Price development for different cost types
- Effective interest rate
- reference value
- Permitted simplifications and cut-off rules
- Partial results that are to be shown and associated descriptions
- Level of detail of the calculations and the documentation
- Timing of payments per period

These conventions are specified for indicator 3 of this criterion. In special cases or for particular schemes, deviations from these standard conventions may be appropriate. These deviating specifications are indicated depending on the scheme. The benchmarks to which the life cycle costs are compared have been determined on the basis of the same conventions.

Adaptation to German price benchmarks

General principles

DGNB has developed a LCC online tool suitable for this purpose to simplify the audit procedure (for the transition period an excel tool will be used as an alternative solution). Costs are entered into the DGNB LCC tool in local currency and adapted to German prices. DGNB conducted a worldwide comparison of building construction costs to arrive at a factor to compare German prices to other countries.
This process is automatically completed when the relevant country and its related adaptation factors are entered in the

'cost calculation' chart. The country adaptation factors for construction costs are listed in Appendix 6.

NOTE: the adaptation factors for countries not listed in Appendix 6, are to be agreed with the DGNB.

The reference year and quarter for the current version is Q3 2017. The tool generates project specific costs per square metre in local currency as well as in Euro and calculates the checklist points to be entered into the evaluation matrix (Euro (€) to local currency exchange rates see Appendix 7).

Evaluation
Evaluation in the certificate requires an assessment based on the following documents:

- The weighted life-cycle costs in €/m²GFA_S for selected structural and technical building components (according to Appendix 1) and for selected costs of operation and maintenance (according to the Appendix 2, 3 and 4), based on a 50-years period (only for Logistics and Production = 20 years).
- Final energy demand of the building from the energy performance certificate (or from the energy demand simulation/calculation) for the completed building (same as from the criterion ENV1.1)
- Clear assignment to energy sources (as above, same as in criterion ENV1.1), possible details of feed-in volume and feed-in tariff:
  for the first **20 years**: the feed-in tariff can be included as a credit.
  For the following **30 years**: the feed-in tariff can no longer be included. The electricity demand of the building can be reduced with onsite produced el. energy up to a total el. energy demand of the building, unless onsite energy production is already included in the EPC calculation.
- Values from the calculations regarding water demand and waste water from the specifications of criterion "ENV2.2 – Potable water demand and waste water volume"
- Details of the servicing, inspection and repair costs using the generalised percentages specified in Appendix 3, or alternatively based on accessible and documented reference values (such as contracts, manufacturer specifications or similar)
- Assessment of the cleaning costs (see Appendix 2) on the basis of the areas and materials from the building elements catalogue for the life cycle assessment or alternatively based on accessible reference values (such as manufacturer specifications or similar)

In addition, the following documents are required for assessment in accordance with the detailed method:

- Building elements catalogue for the life cycle assessment (criterion "ENV1.1 – Building life cycle assessment")
- Durations of use of components in accordance with Appendix 3
- Detailed breakdown of production costs that can be assigned to the components in the building elements catalogue that clearly demonstrate assignment to the product-specific duration of use

Simplified method
In the simplified method, the costs for inspection, servicing and repair are shown as percentages in relation to the production costs. The production costs and the operating costs for energy demand, cleaning and water/waste water are recorded in detail.

The reference period for the building components that are to be taken into account and the calculation parameters are specified in the "Conventions" section (see usage-specific description) and the appendices.

The applicable percentages for the generalised representation must be taken from Appendix 3. This appendix

depends on the scheme in question.

Detailed method

The detailed method expands the breakdown of the production costs from the simplified method on the sub-level in accordance with Appendix 1 (including reference values and building specification). The detailed method can only be applied in full, which means that if foundation is considered in detail, the entirety of structural components must be shown in detail. This is intended to prevent elements with a long duration of use being shown "in detail" while the generalised average from the simplified method is used for other elements.

The following applies for the analysis of the repair costs: Depending on the installation situation and usage situation of an element, either an appropriate and plausible assignment of the duration of use from Appendix 3 must be reached, or, as an alternative, accessible reference values, manufacturer specifications or similar must be used. In addition, a breakdown of the production costs that goes beyond sub-level in accordance with Appendix 1 may be necessary.

For all other costs taken into account, the approaches used in the simplified method (including working with accessible reference values, manufacturer specifications or similar) continue to apply in exactly the same way.
The DGNB provides a tool for submission of documentation that calculates the LCC data and transfers the results for the subsequent conformity check. When using this tool, the production costs which are project-specific for time of completion, must be adjusted to reflect the reference price levels using relevant price indices for the country in question. The corresponding information must be entered in the "Basic data" tab under reference values. The reference year and quarter for the current version is **Q3 2017**.

The following data must be determined in order to retrieve the construction cost index:

- Year: Project-specific
- Quarter: Project-specific
- Measured figures with/without VAT: Indices including VAT
- Building type: Project-specific
- Form: Construction work on the building

Appendices depending on scheme

- Appendix 1: Building Components to be included in accordance with this appendix
- Appendix 2: Cleaning costs
- Appendix 3: Parameters for servicing and maintenance
- Appendix 4: Applicable unit prices for energy sources, fresh water and waste water

IV. Usage-specific description

Conventions

Office **Education** **Residential** **Consumer market** **Shopping centre** **Department stores** **Hotel**

The following conventions must be assumed for assessment of the life cycle costs:

Table 1: Conventions for the calculation of the life cycle costs (various schemes)

CONVENTIONS	
Reference period	50 years
Life cycle phases	Construction, use
Costs	Selected building components: **Production costs in accordance with Appendix 1** Structural Components – construction works Technical Components – installations (incl. maintenance in accordance with Appendix 3) **Operation costs in accordance with Appendix 2** Supply and disposal costs Water Fuels, energy Sewerage Cleaning and maintenance of buildings Inspection and servicing of the structures Inspection and servicing of the installations Repair costs Structural repairs Repair of the installations
Calculations included	Final energy demand, water demand and waste water, cleaning areas
Price development for different cost types	General construction price increase 2% Costs for water and waste water 2% Costs for energy 5%
Effective interest rate	3%[1]
reference value	m² GFA_S / **Department stores**: m² GFA
Permitted simplifications, cut-off rules	Current cost level with an estimate of the costs for the final

[1] Determination: On the one hand, the used guide value for determining the cost-optimal levels for energy efficiency calculations in accordance with "Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements" was used for determining the effective interest rate. On the other hand, assessments carried out in-house in 2017 show that an effective interest rate of 3% constitutes a justified assumption.

	invoice for completion of the building. Representation of the entire building or, for partial buildings, in accordance with the system limits Cost information on main-level of structural components, on sub-level of technical components in accordance with Appendix 1 in the simplified method For the detailed method, documentation of the components in the same way as for the simplified method of the life cycle assessment (criterion "ENV1.1 – Building life cycle assessment")
Partial results that are to be shown and associated descriptions	Net present value divided into: ■ Structural components production costs in accordance with Appendix 1 ■ Technical components production costs in accordance with Appendix 1 Separate operating costs for: ■ Water, ■ Energy, ■ Waste water, ■ Cleaning and maintenance Operation costs divided into: ■ Inspection and servicing ■ Repair (separately for structural and technical components in accordance with Appendix 1 and 3)
Level of detail of the calculations and the documentation	See description for the simplified and detailed method
Timing of the payment per period	In arrears

Logistics **Production**

In contrast to the requirements of the other schemes, the final energy demand may be determined via a thermal simulation as an alternative to the building energy performance certificate. See also criterion "ENV1.1 – Building life cycle assessment".

The reference period comprises 20 years.

For industrial buildings with a clear room height greater than 12 m, [m³ GV*a] must be selected as the unit of reference for the calculation of the evaluation points. For single-storey and multi-storey industrial buildings with a clear room height less than 12 m, the reference value [m² GFA_S* a] must be selected.

The following conventions must be assumed for assessment of the life cycle costs:

Table 2: Conventions for the calculation of the life cycle costs (**Logistics** and **Production**)

CONVENTIONS	
Reference period	20 years
Life cycle phases	Construction, use
Costs	Selected building components: **Production costs in accordance with Appendix 1** Structural components – construction works Technical components – installations (incl. maintenance in accordance with appendix 3) **Operation costs in accordance Appendix 2** Supply and disposal costs Water Fuels, energy Sewerage Cleaning and maintenance of buildings Inspection and servicing of the structures Inspection and servicing of the installations Repair costs Structural repairs Repair of the installations
Calculations included	Final energy demand, water demand and waste water, cleaning areas
Price development for different cost type	General construction price increase 2% Costs for water and waste water 2% Costs for energy 5%
Effective interest rate	3%[2]
reference value	m² GFA_S or m³ GV
Permitted simplifications, cut-off rules	Current cost level with an estimate of the costs for the final invoice for completion of the building. Representation of the entire building or, for partial buildings, in accordance with the system limits Cost information on main-level of structural components, sub-level of technical components in accordance with Appendix 1 in the simplified method.

[2] See footnote 1

	For the detailed method, documentation of the components in the same way as for the simplified method of the life cycle assessment (criterion ENV1.1)
Partial results that are to be shown and associated descriptions	Net present value divided into: ■ Production costs of the structural components in accordance with Appendix 1 ■ Production costs of the technical components in accordance with Appendix 1 Separate operating costs for: ■ Water, ■ Energy, ■ Waste water, ■ Cleaning and maintenance Operation costs divided into: ■ Inspection and servicing ■ Repair (separately for structural and technical components in accordance with Appendix 1 and 3)
Level of detail of the calculations and the documentation	See description for the simplified and detailed method
Timing of the payment per period	In arrears

Special conditions and additional expenses

In the event of justified additional expenses due to special requirements and conditions, these may be deducted from the statement of life cycle costs. A plausible, clear and justified statement of the additional expenses is required for this.

Typical cases where additional expenses are considered neutral for the evaluation include:

- Difficult foundation soil conditions
- Supporting adjacent structures
- Special requirements under construction law, such as historic preservation orders
- Innovations that are prototypical in nature

The additional expense associated with the special conditions must be quantified (e.g. documentation of the costs on the sub-level in accordance with Appendix 1 with associated reference values and building specification). The substantiated additional expense (not the overall costs) may be subtracted from the production costs.

The additional expenses, costs resulting directly from an innovation (in accordance with Appendix 1 on the sub-level or individual element) must be documented.

Alternatively, in the event of a significant discrepancy between the building evaluated as part of the certification process and the assumptions used as a basis for the production costs of the reference value, target value and limit value definition (benchmarks), the benchmarks for the "production costs" benchmark element can be adjusted on a project-specific basis following agreement with the DGNB. The underlying assumptions for calculation of the

benchmarks are shown in Appendix 5. The country-specific / project-specific adjustment is permitted for all uses and is recommended for the various climatic zones and structures such as high-rise buildings and high-bay warehouses.

Categorisation

Office **Residential**

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following three categories:

Category 1: New buildings are generally evaluated in category 1.

Category 2: Buildings with above-average requirements in terms of representativeness are evaluated in category 2. The measures and features that help achieve the required level of representativeness must be described in order to justify classification into category 2.

Classification into category 2 must be justified in detail and verifiably documented. If this is not done, the building is categorised into category 1 as standard.

The following must be considered to constitute above-average requirements in terms of representativeness:

- High-quality, high-durability materials (in floors and walls) in terms of materiality and construction
- Requirements resulting from a location of category A (lucrative, high-traffic (business) location in the centre of a town or city)
- Advanced technical facilities

Education

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following three categories:

- Day care facilities, kindergartens
- Schools
- Institutional buildings

Consumer market

Consumer markets are evaluated in category 1. If the building contains refrigerated counters, additional points can be awarded if the associated annual energy consumption per linear metre of refrigeration units falls below the reference value of 3000 kWh/linear metre.

Table 3: Energy consumption of refrigerated counters

ANNUAL ENERGY CONSUMPTION PER LINEAR METRE OF REFRIGERATED COUNTER	POINTS
≤ 3000 kWh/linear metre	1
≤ 1200 kWh/linear metre	10

Linear interpolations can be carried out between the specified values.

Shopping centre

For shopping centres, fit-out carried out by the tenant in the rental areas is excluded from the analysis.

Shopping centres are evaluated in category 1.

If the building includes underground garages or multi-storey car parks, the life cycle costs can be adjusted for the costs of these areas. Areas 7.4 (vehicle parking areas), 9.4 (vehicle circulation areas) and 9.9 (other circulation areas (such as driving lanes)) in accordance with the space and area description under the chapter T&D_04 must be taken into account.
This deduction can be carried out using a detailed method via documentation of the actual costs incurred for these areas, or alternatively using cost parameters from the German Information Centre for Construction Costs adapted to the local construction costs (adaptation factors according to Appendix 6).

Table 4: Lump sum cost deduction for the areas 7.4, 9.4 and 9.9 in accordance with T&D_04.

TYPE OF CAR PARK	DEDUCTION IN ACCORDANCE WITH THE GERMAN INFORMATION CENTRE FOR CONSTRUCTION COSTS 2017 (NET) ADAPTED TO THE LOCAL COSTS
Underground garages	673 €/m² GFA_S / Country adaptation factor
Multi-storey car parks	543 €/m² GFA / Country adaptation factor

Department stores

If the building includes underground garages or multi-storey car parks, the life cycle costs can be adjusted for the costs of these areas. Areas 7.4 (vehicle parking areas), 9.4 (vehicle circulation areas) and 9.9 (other circulation areas (such as driving lanes)) in accordance with T&D_04 must be taken into account.
This deduction can be carried out using a detailed method via documentation of the actual costs incurred for these areas, or alternatively using cost parameters from the German information centre for construction costs adapted to the local construction costs (adaptation factors according to Appendix 6)

Table 5: Lump sum cost deduction for the areas 7.4, 9.4 and 9.9 in accordance with T&D_04.

TYPE OF CAR PARK	DEDUCTION IN ACCORDANCE WITH THE GERMAN INFORMATION CENTRE FOR CONSTRUCTION COSTS 2017 (NET) ADAPTED TO THE LOCAL COSTS
Underground garages	673 €/m² GFA_S / Country adaptation factor
Multi-storey car parks	543 €/m² GFA / Country adaptation factor

Logistics **Production**

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following two categories:

- **Category 1:** Warehouses/logistics buildings as well as production facilities with low requirements are generally evaluated in category 1

- **Category 2:** Production facilities with increased requirements

In principle, logistics buildings and production facilities must be assigned to the following categories depending on the type of air conditioning they use:

I: No air conditioning
II: Heated; indoor air temperatures between 0 °C and 12 °C
III: Heated; indoor air temperatures between 12 °C and 19 °C
IV: Heated; indoor air temperatures > 19 °C
V: Heated, cooled; indoor air temperatures > 19 °C
VI: Air conditioned; indoor air temperatures > 19 °C
VII: Refrigerated; indoor air temperatures < -5 °C

For properties of category VII, the building technology system components of the refrigeration technology including production costs and associated servicing, inspection, repair and disposal costs – must be taken into account in the LCC calculation.

The final energy demand for refrigeration must be determined separately and calculated over a reference period of 20 years, but is not incorporated into the LCC calculation.

Hotel

For the purposes of evaluation, the building must be clearly categorised into one of the following two categories depending on its designation in accordance with the World Tourism Organization (UNWTO) hotel classification system or classification system in cooperation with the ECC-Net (The European Consumer Centres' Network):

- **Category 1:** 0 to 3 stars
- **Category 2:** 4 or more stars or higher level of facilities (swimming pool, spa, etc.)

Assembly buildings

If the building includes underground garages or multi-storey car parks, the life cycle costs can be adjusted for the costs of these areas. Areas 7.4 (vehicle parking areas), 9.4 (vehicle circulation areas) and 9.9 (other circulation areas (such as driving lanes)) in accordance with T&D_04 must be taken into account.
This deduction can be carried out using a detailed method via documentation of the actual costs incurred for these areas, or alternatively using cost parameters from the German information centre for construction costs adapted to the local construction costs (adaptation factors according to Appendix 6)

Table 6: Lump sum cost deduction for the areas 7.4, 9.4 and 9.9 in accordance with T&D_04.

TYPE OF CAR PARK	DEDUCTION IN ACCORDANCE WITH THE GERMAN INFORMATION CENTRE FOR CONSTRUCTION COSTS 2017 (NET) ADAPTED TO THE LOCAL COSTS
Underground garages	673 €/m² GFAs / Country adaptation factor
Multi-storey car parks	543 €/m² GFA / Country adaptation factor

Appendix 1

The following components must be included in the respective cost calculations:

The following building components and facilities are included:

PRODUC-TION COSTS	RENO-VA-TION	MAINTEN-ANCE	ENER-GY	WA-TER/WA STE WATER	CLEAN-ING	BUILDING COMPONENTS (MAIN AND SUB-LEVELS)	CONTENT
						Site	
						Clearance and development	Cost of all preparatory measures required to enable construction work on the site
						Structural building compo-nents	Costs of works and supplies relating to the construction of the building but not including services. This group comprises fitments permanently fixed to the building fabric and designed for its particular function, as well as other general measures undertaken in connection with the con-struction works.
X	X	X				**Excavation**	Soil removal (primary excavation), excavation including working space excavation and slope cutting, storage, backfilling, transport to and from site
X	X	X				**Foundations**	The following costs comprise the associated earthworks and bindings.
X	X	X		X	X	**External walls**	Walls and columns that are exposed to external atmosphere or adjoin the soil or other structures
X	X	X		X	X	Load-bearing external walls	Load-bearing external walls, including horizontal damp-proofing
X	X	X				Non-load-bearing external walls	External walls, parapets, infillings, but not including claddings
X	X	X				External columns	Columns and piers with a slenderness ratio of 1:5 or less
X	X	X		X	X	External doors and windows	Windows and display windows, doors and gates, including sills, frames, fittings, actuating systems, ventilation components and other built-in elements
X	X	X		X	X	Cladding units	External claddings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers
X	X	X				Internal linings (of external walls)	Internal linings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers
X	X	X		X	X	Prefabricated façade units	Prefabricated façade units, consisting of external walls, windows, doors, claddings
X	X	X		X	X	Solar protection	Roller shutters, awnings, blinds, including actuating systems
X	X	X				External walls, other items	Gratings, railings, buffers, and handrails
X	X	X				**Internal walls**	Internal walls and columns
X	X	X				**Floors and ceilings**	Floors and ceilings, stairs and ramps above the foundations and be-neath the roof area

X	X	X					Floor structures	Floors, stairs, ramps, balconies, loggias, including suspender beams and joists, and infill elements such as hollow blocks, false floors, fills, but not including coverings and linings
X	X	X		X	X		Floorings	Coverings on floors, including screeds, damp-proof courses, insulating and protective layers, wearing surfaces; false floors for services and floating floors
X	X	X					Ceiling linings	Linings of ceilings, including plastering, damp-proof courses, insulating and protective layers; false ceilings for lighting and other services
X	X	X					Floors and ceilings, other items	Covers, manhole tops, gratings, railings, buffers, handrails, fixed ladders, foldaway ladders
X	X	X					**Roofs**	Flat or sloping roofs
X	X	X					**Structural fitments**	Costs of fitments permanently fixed to the building fabric, but exclusive of fitments designed for its particular function. The principal criterion for distinguishing this costs from furnishing costsis that the nature of the fitments and the method by which they are fixed require technical and planning measures (e.g. preparation of plant layout plans, structural analyses and other calculations, connection to services)
X	X	X					**Other construction-related activities**	Construction work and general types of construction work that cannot be assigned to individual cost groups relating to the building structure nor included in other cost groups
							Technical building components	Costs of all services or parts thereof installed in, connected or permanently fixed to the building fabric The individual services comprise the associated supports, fixings, valves, thermal insulation, provisions for noise control and fire protection, covers, cladding, paintwork, marking and measurement and control systems.
X	X	X		X			**Sewerage, water and gas systems**	
X	X	X		X			Sewerage systems	Gullies, drains, sewers, sewage treatment systems, sewage lifting plants
X	X	X	X	X			Water supply systems	Water extraction and conditioning plants, pressure boosters, pipework, water heaters, sanitary appliances
X	X	X					Gas supply systems	Gas supply systems for industrial heating: Gas storage and generation plants, supply meter points, pressure control equipment and gas pipes, unless included in costs for heat supply systems
X	X	X					Fire-fighting installations	Sprinklers, gas extinguishing systems, extinguishing water pipes, wall hydrants, fire extinguishers
X	X	X		X			Sewerage, water and gas systems, other items	Plumbing units, sanitary blocks
X	X	X	X				**Heat supply systems**	
X	X	X	X				Heat generators	Fuel supply, heat supply meter point, heat generation based on fuel or on renewable energy sources, including chimney connections, central water heaters

X	X	X	X				Heat distribution networks	Pumps, distributors; pipework for space heating, HVAC systems and other heat consumers
X	X	X	X				Space heating	Radiators, panel heating systems
X	X	X	X				Heat supply systems, other items	Chimneys, unless included in other cost groups
X	X	X	X				**Air treatment systems**	Systems with and without ventilation functions
X	X	X	X				Ventilation systems	Exhaust air systems, supply air systems, exhaust/supply air systems with or without a thermodynamic air treatment function, mechanical smoke extraction systems
X	X	X	X				Partial air conditioning systems	Systems with two or three thermodynamic air treatment functions
X	X	X	X				Air conditioning systems	Systems with four thermodynamic air treatment functions
							Process air plants	Paint mist separation systems, process exhaust air systems, suction plants
X	X	X	X				Refrigerating plants	Refrigerating plants for air treatment systems: chilling and recooling plants, including pumps, distributors and pipework
X	X	X	X				Air treatment systems, other items	Ventilated ceilings, cooling ceilings, exhaust air windows; false floors for services, unless included in other cost groups
X	X	X					**Power installations**	
X	X	X					High and medium voltage plants	Switchboards, transformers
X	X	X					Independent power supply installations	Power generating units, including cooling, exhaust systems and fuel supply, central storage batteries and uninterruptible power supply systems, photo-voltaic systems
X	X	X					Low-voltage switchgears	Low voltage main distributors, reactive power compensators, peak reading indicators
X	X	X					Low voltage installation equipment	Cables, conduits, sub-distributors, installation systems and appliances
X	X	X	X				Lighting systems	Fixed luminaires, safety lighting
X	X	X					Lightning protection and earthing systems	Lightning rods, lightning conductors, connections to earth, equipotential bonding
X	X	X					Power installations, other items	Frequency converters
X	X	X					**Telecommunications and other communications systems**	The individual systems comprise the associated distributors, cables and wiring.
X	X	X					**Transport systems**	
X	X	X					Lifts	Passenger lifts, goods lifts
X	X	X					Escalators, moving pavements	
X	X	X					Inspection and maintenance conveyors	Window-cleaning cradles and other inspection and maintenance conveyors
X	X	X					Conveying plants	Automatic goods transport systems, office dumbwaiters, pneumatic tube conveyors
X	X	X					Cranes	Including lifting appliances
X	X	X					Transport systems, other items	Lifting platforms

X	X	X					**Building automation**	Costs of automation including associated distributors, cables and wiring
X	X	X					**Other services-related work**	Services and general measures in connection with services that cannot be assigned to separate cost groups for services or cannot be recorded in other cost groups
							External works	Costs of construction work and supplies relating to the construction of ground surfaces and circulation areas, structures and services outside of the building, unless included in costs for Clearance and development
								The individual cost groups comprise the associated work such as earth-works, substructures and foundations.
							Furnishings, furniture and artistic appointments	Costs of all movable or easily fixed furnishings and appointments re-quired for the commissioning of the structure, for general use, or for the decoration of the structure and the outdoor areas.
							Incidental building costs	Costs arising during planning and execution based on fee structures, fee scales or in accordance with other contractual agreements

Appendix 2

Cleaning costs

COST TYPES	CONTENT	€/M²A
1	**External doors and windows**	
	Easily accessible (without aids)	2.25
	Average value (e.g. façade inspection and maintenance conveyors and cleaning bridges)	3.00
	Difficult to access (e.g. cherry-pickers or climbing harnesses)	4.50
2	**Cladding units**	
	Natural stone (soft)	2.83
	Aluminium, stainless steel, copper cladding, steel (corrosion-protected)	1.42
	Ceramics, artificial stone, ashlar, natural stone (hard)	0.71
	Solar protection	2.13
3	**Internal doors and windows**	
	Internal doors	3.60
	Internal windows	2.25
4	**Floorings**	
	Artificial stone, natural stone, screed, flexible floors or similar	6.30

	Textile or similar	7.08
	Wood or similar	6.30
5	**Sanitary areas**	
	Up to 10 m²	89.25
	Up to 30 m²	59.50
	Up to 30 m²	44.63

The adaptation to local conditions could not be considered since the final benchmarks are given in accordance to German pricing index

Additional information

	€/H (NET)
Hourly charge for cleaning	17.00
Hourly charge for glass cleaning	22.50

The adaptation to local conditions could not be considered since the final benchmarks are given in accordance to German pricing index

Appendix 3

Parameters for servicing and maintenance

The following table must be applied for the LCC statement in accordance with the simplified method. The detailed method can be used to represent building components of sub-level or beyond, and involves replacing the specifications from the simplified method with specific details that must be documented. These specific details must be selected to be consistent with the information from the life cycle assessment (see also explanations of durations of use in ENV1.1).

BUILDING COMPONENTS	ASSUMED DURATION OF USE IN YEARS	EXPENDITURE FOR SERVICING/ INSPECTION IN % PER YEAR	EXPENDITURE FOR REPAIRS IN % PER YEAR
Structural building components			
	In accordance with the document "Guideline for Sustainable Building" on behalf of Ministry of Transport, Building and Housing Germany	0.1	Irregular repair: Replacement investment after expiry of the duration of use or lump sum repair cost of **0.35%** for all structural building components
Technical building components			
Sewerage, water and gas systems	50	1.01	0.98
Heat supply systems	25	0.41	0.66
Air treatment systems	25	0.96	1.10
Power installations	25	0.60	0.70
Telecommunications and other communications systems	25	1.04	1.04
Transport systems	25	1.76	1.78

Building automation	25	1.16	0.76

On the basis of VDI 2067:2000 and supplement on the basis of the values for the duration of use for components as well as AMEV 2013, adjusted (without operation)

The details regarding repair of the building technology (technical building components) should be considered to refer to "ongoing repairs". A replacement investment after expiry of the duration of use must also be taken into account, but this currently does not include demolition and disposal.

Simplified method:
As an alternative to the simplified method, a detailed list can also be compiled.
For technical building components, it is permissible to assume a replacement investment after 20 years across all components.

Appendix 4

Applicable unit prices for energy sources, fresh water and waste water

MEDIUM	TYPE	NET PRICE/UNIT
Electricity	electricity power generation mix	0.25 €/kWh
Oil		0.06 €/kWh
Natural gas		0.06 €/kWh
Wood pellets		0.05 €/kWh
Woodchips		0.03 €/kWh
Long-distance district heating/CHP	Fossil	0.09 €/kWh
	Renewable	0.07 €/kWh
Fresh water		2.01 €/m³
Waste water	Used water	2.14 €/m³
	Precipitation	1.10 €/m³

Source for electricity price: BDEW 2017, approx. four-year average, net

The adaptation to local conditions could not be considered since the final benchmarks are given in accordance to German pricing index

Appendix 5

Basis of the LCC benchmarks

Production costs:
As a general rule, the target value and reference value of the production costs are assumed to be equal ("sustainable construction does not cost more than the present standard").

Basic data for establishing benchmarks for the schemes: Total of production costs for building structural and technical components (all data in EUR/m² GFA_S – net)

Office	**Buildings of medium standard**		**Buildings with increased representativeness requirements**	
Reference and target value	1723	Average value of medium and high standard for office buildings in accordance with the German information centre for construction costs 2017 (details in T&D_06)	2052	High standard in accordance with the German information centre for construction costs 2017 (details in T&D_06)
Limit value	2052	High standard in accordance with the German information centre for construction costs 2017	2258	10% above reference value

Education	**Day care facilities/kindergartens**		**Schools**		**Institutional buildings**	
Reference and target value	1383	Average value of medium and high standard for day care facilities in accordance with the German information centre for construction costs 2017	1447	General education schools in accordance with the German information centre for construction costs 2017	2037	Institutional buildings in accordance with the German information centre for construction costs 2017
Limit value	1494	High standard for day care facilities in accordance with the German information centre for construction costs 2017	1592	10% above reference value	2240	10% above reference value

Residential	**Buildings of medium and higher standard**			
Reference and target value	939	High standard for apartment buildings (6–19 residential units) in accordance with the German information centre for construction costs 2017 * factor of 1.1		
Limit value	1024	10% above reference value		
Consumer market	**Retail/supermarket**		**Shopping centre**	
Shopping centre				
Reference and target value	1300	DGNB evaluation	1152	Department stores with no residential function in accordance with the German information centre for construction costs 2017 * factor of 1.2
Limit value	1500	DGNB evaluation	1267	10% above reference value
Department stores	**Retail parks**		**Department stores**	
Reference and target value	922	Consumer markets in accordance with the German information centre for construction costs 2017	1547	Department stores, in-house assessments
Limit value	1014	10% above reference value	1701	10% above reference value
Logistics	**Warehouses/logistics/production facilities with low requirements**		**Production facilities with increased requirements**	
Production				
Reference and target value	908	Average value for logistics buildings not intended for mixed use and skeleton construction of	1019	Solid construction of production buildings in accordance with the German

		production buildings in accordance with the German information centre for construction costs 2017		information centre for construction costs 2017
Limit value	1089	20% above reference value	1223	20% above reference value
Hotel	**0–3 stars**		**4 or more stars**	
Reference and target value	938	In-house assessments for hotels	1263	In-house assessments for hotels
Limit value	1031	10% above reference value	1389	10% above reference value
Assembly buildings	**Assembly buildings**			
Reference and target value	2150	Mean value of buildings for cultural and musical purposes according to German information centre for construction costs 2019		
Limit value	3529	Max. value of buildings for cultural and musical purposes according to German information centre for construction costs 2019		

Water/waste water:

Office: A flat rate of 1.20 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Residential: A flat rate of 7.27 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Education: A flat rate of 1.11 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Hotel: A flat rate of 13.63 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Department stores, shopping centres, consumer markets: Derived from the FM benchmarking report 2016, 3.03 EUR/m²a is used for the reference value, the value for the first quantile is used for the target value, and the value for the third quantile is used for the limit value.
Logistics, production: Derived from the FM benchmarking report 2016, 3.01 EUR/m²a is used for the reference value, the value for the first quantile is used for the target value, and the value for the third quantile is used for the limit value. Assembly buildings: Derived from the FM benchmarking report 2019 "Retail Real Estate", 0.86 EUR / m²a is used as the reference value, the value for the 1st quantile for the target value and the value for the 3rd quantile for the limit value.

Rainwater:
All uses: The 0.81 EUR/m² floor area per year is used for the reference value, derived from 736 mm of precipitation per year, typical number of storeys = 4 (all uses except for production and logistics, where instead number of storeys = 1) and waste water costs for rainwater of 1.1 €/m³. 0 EUR/m² is used for the target value, the limit value is equal to the reference value.

Operation costs (Structural and technical components): Regular/irregular
All uses: The reference, target and limit values used are 0.35% of the production costs per year for structural and technical components, an individual value is determined and used for each scheme.

Cleaning costs:
The average values typical for the use of the building from the FM.benchmarking report 2016 are used for the reference values. The values from the first quartile are used for the target values and the values from the third quartile are used for the limit values (example for office: Target value of 5.04 EUR/m²GFAs, reference value of 8.08 EUR/m²GFAs, limit value of 12.41 EUR/m²GFAs).

Energy:
Determined and averaged final energy values from certified buildings, increased by a factor of 1.2, are used for the reference values for energy (see table below). For specific schemes, typical distributions of energy and heat are used, likewise derived from certifications. For calculation of the energy costs, typical combinations of energy sources are also used for each scheme likewise derived from certified buildings. The target value for the final energy demand is determined by reducing the reference value by a factor of 0.6. The limit value is determined by increasing the final energy demand reference value by a factor of 1.4. The data used as a basis for calculation of the energy costs corresponds to the specifications above. 25 ct/kWh of electricity is used as the value for electricity, while the values for heat, derived from the combinations determined for the energy sources used, are 9 ct/kWh of heat (all uses other than logistics and production), or 7 ct/kWh of heat for logistics and production.

Table: Input variables for final energy values used for establishing benchmarks (in kWh/m² GFA/a)

	Target value	Reference value	Limit value
Office	45	110	150
Education	50	120	170
Consumer markets	30	70	100
Shopping centre	55	130	180
Department stores	45	110	150
Logistics	45	110	150
Production buildings	45	110	150
Hotel	100	240	330
Residential	30	70	100
Assembly buildings	60	110	150

Appendix 6

Adaptation factors

(see also chart in LCC-Tool)

Adapting local construction costs to German price levels

For the calculation of building related life cycles, we propose the following approach:
The construction costs for single building components or technical systems have to be adapted to German prices. Therefore, we created a comparison regarding the costs for constructing costs in other countries to get a coefficient that describes the relation between German prices in comparison to other countries.

The project's cost of manufacture has to be multiplied with the coefficient from the table to get a weighted cost of manufacture that is comparable. This step is automatically completed by the LCC tool.

COUNTRY	FACTOR CONSTRUCTION COSTS FROM Q3 2017	
	Office **Education** **Hotel** **Residential** **Consumer market** **Shopping centre** **Department stores** **Assembly buildings**	**Logistics** **Production**
ARGENTINA	1.73	1.64
AUSTRALIA	1.03	1.28
AUSTRIA	0.94	0.94
BAHRAIN	1.49	1.46
BELGIUM	1.02	1.00
BRAZIL	2.04	1.31
BULGARIA	2.06	1.81
CANADA	1.16	1.08
CHILE	1.56	1.07

CHINA	2.71	2.23
COLOMBIA	2.25	1.93
CROATIA	1.59	1.48
CZECH REPUBLIC	1.65	1.38
DENMARK	0.73	0.76
EGYPT	1.88	1.88
FINLAND	0.72	0,68
FRANCE	0.95	0,94
GERMANY	**1.00**	**1.00**
GREECE	1.11	1.04
HONG KONG	0.63	0.40
HUNGARY	1.38	0.97
INDIA	3.69	1.96
INDONESIA	2.35	1.88
IRELAND	0.90	1.00
ITALY	1.10	1.25
JAPAN	0.83	0.51

KENYA	3.41	3.31
KUWAIT	1.39	1.36
LUXEMBURG	0.88	0.84
MALAYSIA	2.63	2.35
NETHERLANDS	1.23	1.07
NEW ZEALAND	1.14	1.14
NORWAY	0.76	0.66
PHILIPPINES	3,21	2.89
POLAND	1.32	1.55
PORTUGAL	1.48	1.30
ROMANIA	1.95	1.55
RUSSIA	2.13	1.25
SAUDI ARABIA	1.34	1.34
SERBIA	1.88	1.88
SINGAPORE	1.22	1.04
SOUTH AFRICA	2.29	2.16
SOUTH KOREA	1.31	0.95

SPAIN	1.17	1.36
STATE OF QATAR	1.22	1.05
SWEDEN	0.70	0.81
SWITZERLAND	0.69	0.59
THAILAND	2.21	1.64
TURKEY	2.89	1.82
UAE	1.24	1.24
UNITED KINGDOM	0.72	0.93
USA	0.76	0.72
VIETNAM	2.73	2.40
Adaptation factors for further countries to be agreed with the DGNB		

Appendix 7

Local currency rates

COUNTRY	LOCAL CURRENCY	CURRENCY EXCHANGE RATE FROM Q3 2017
ARGENTINA	ARS	17.92
AUSTRALIA	AUD	1.49
BAHRAIN	BHD	0.44
BRAZIL	BRL	3.71
BULGARIA	BGN	1.96
CANADA	CAD	1.47
CHILE	CLP	755,09
CHINA	CNY	7.84
COLOMBIA	COP	3495.28
CROATIA	HRK	7.43
CZECHIA	CZK	26.06
DENMARK	DKK	7.44
EGYPT	EGP	20.83
GERMANY	**EUR**	**1.00**
HONG KONG	HKD	9.18

HUNGARY	HUF	306.20
ICELAND	ISK	124.30
INDIA	INR	75.54
INDONESIA	IDR	15660.09
IRAN	IRR	38822.39
ISRAEL	ILS	4.19
JAPAN	JPY	130.34
KAZAKHSTAN	KTZ	391.19
S.KOREA	KRW	1330.19
KUWAIT	KWD	0.35
MALAYSIA	MYR	5.01
MEXICO	MXN	20.93
NEW ZEALAND	NZD	1.61
NORWAY	NOK	9.34
PHILIPPINES	PHP	59.72
POLAND	PLN	4.26
ROMANIA	RON	4.58

RUSSIA	RUB	69.34
SAUDI ARABIA	SAR	4.41
SINGAPORE	SGD	1.60
SOUTH AFRICA	ZAR	15.48
STATE OF QATAR	QAR	4.28
SWEDEN	SEK	9.55
SWITZERLAND	CHF	1.13
THAILAND	THB	39.20
TUNISIA	TND	2.89
TURKEY	TRY	4.13
UAE	AED	4.32
UKRAINE	UAH	30.41
UNITED KINGDOM	GBP	0.90
URUGUAY	UYU	33.77
USA	USD	1.17
Adaptation factors for further countries to be agreed with DGNB		

Main sources: The International Monetary Fund (IMF) and European central bank (ECB)

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators.

Indicator 1: Calculations of the life cycle costs in planning
It must be proven that a life cycle cost model was drawn up for the building and used as part of the planning process.

Indicator 1.1.1: It must also be proven that the model was drawn up in service phase 3 at the latest and that the most likely/preferred building variants available were compared in terms of production costs and relevant follow-up costs, comprising at minimum the expected energy costs.

Indicator 1.1.2: It must also be proven that the scope of analysis contains all relevant building-related follow-up costs in accordance with the definition.

For this indicator, the target values used for the comparison and adequate documentation of the communication to the planning team must be produced.

Indicator 2: Life cycle cost optimisation
It must be proven that planning optimised for life cycle costs has been carried out. Proof regarding the following aspects must be provided:

- Type of analysis (full consideration or partial analysis),
- Time of analysis (specification of work phase(s))
- Number of alternatives
- Type of alternatives with documentation that significant decisions were investigated.

Indicator 2.2: Circular economy bonus – reuse
For the circular economy bonus, appropriate documentation must be produced proving the relevance of the implemented solution (share of the relevant reference value) and additionally proving either that the solution was reused or that it was not acquired via a leasing model or similar but that its use is instead an integral part of the contract.

Indicator 3: Building-related life cycle costs
A range of different forms of documentation is listed below. The documentation submitted must comprehensively and clearly demonstrate compliance with the requirements for the target evaluation of the individual indicators.

- Table showing the production costs via cost calculation in accordance with Appendix 1
- Table showing the operation costs via cost calculation in accordance with Appendix 2
- Documentation of the life cycle costs for the entire reference period with regard to m² NFA, m² GFA and m³ GV
- Final energy demand of the building in accordance with building energy performance certificate or energy simulation (referring to the criterion ENV1.1)
- Data for the referenced energy sources (in order to take building systems that feed energy into the grid into account, documentation of the feed-in rate achieved must be enclosed).
- Water demand and waste water values taken from criterion ENV2.2

- Sources used for application of generalised values or reference
- Values used for the detailed method for servicing and maintenance on the sub-level of structural and technical components or beyond.

The justification and description of classification into category 1, 2 or 3 should be documented in accordance with the following specifications:

Category 1 / Special conditions and additional expenses:

- E.g. difficult foundation soil conditions: Via documentation from the expert report regarding the foundation soil
- E.g. supports: Suitable photo documentation or design plans
- Documents and/or specifications required under construction law
- Innovation: reference values and building specification

Category 2:

- Materials or technical facilities used with installation location and quantities
- Expert report regarding the location/site

Category 3:

- Floor plan and cross-section with dimensioning

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
all	General and evaluation: scheme “Assembly buildings” has been added	16.09.2021
236	Evaluation: benchmarks for the scheme “Consumer market” updated	16.09.2021
243	Evaluation: clarification regarding the onsite el. energy production and distribution rules	16.09.2021

II. Literature

- ISO 15686-5. Buildings and constructed assets – Service-life planning – Part 5: Life-cycle costing. Berlin: Beuth publisher. June 2008
- Nachhaltiges Bauen [Sustainable building] guide by the Federal Ministry of Transport, Building and Urban Development (Bundesministerium für Verkehr, Bau und Stadtentwicklung) (2013)
- German information centre for construction costs (BKI): BKI Baukosten 2017 Neubau – Statistische Kostenkennwerte für Gebäude [BKI construction costs 2017, new buildings – Statistical cost parameters for buildings]. Stuttgart 2017
- Sustainable Development Goals icons, United Nations/globalgoals.org
- FM.benchmarking report 2016: Published by Prof. Uwe Rotermund, Ingenieurgesellschaft mbH & Co KG. Höxter, 2016
- European Construction Intelligence 2018, construction cost index, RLB – Euro Alliance.
- International construction costs 2017, Arcadis Consulting, 2016
- Annual Construction Cost Handbook Singapore 2018, Arcadis Consulting, 2018
- Construction Cost Handbook Malaysia 2018, Arcadis Consulting, 2018
- Exchange Rate Report – IMF, International monetary fund, 2017
- International construction market survey 2018, Turner & Townsend, April 2018
- Hotel Classification Systems, UNWTO World Tourism Organization, 2015
- Classification of hotel establishments within the EU, ECC The European Consumer Centres' Network 2009

Guideline for Sustainable Building, Federal Office for Building and Regional Planning, Ministry of Transport, Building and Housing Germany, 2001

ECO2.1

Flexibility and adaptability

Objective

This criterion is aimed at making the building's design as flexible as possible and creating the greatest possible potential for conversion.

Benefits

The ease with which a building can be adapted to changing requirements helps raise user satisfaction; it can prolong the building's service life and reduce costs incurred throughout its life cycle. Flexibility and adaptability reduce the risk of vacancy and contributes to the long-term economic success of a building.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Moderate	11.3	Inclusive and sustainable urbanisation	11.1.a/c	Land use
Low	8.4	Improve resource efficiency in consumption and production	7.1.a/b	Resource conservation
			8.1	Resource conservation
	12.2	Sustainable management and use of natural resources		
	12.5	Substantially reduce waste generation		

Outlook

In light of social change, for most types of buildings, flexibility and adaptability to other types of usage are key future themes that we should address. Demographic change, Work 4.0, Industry 4.0 and digitalisation will substantially change our building demands. This criterion will become increasingly important and it will be adapted to incorporate future technological advancements.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Assembly buildings	7.5%	3
Production	9.6%	3

EVALUATION

The aim here should be to achieve a high proportion of usable floor area relative to the total floor area of the building, building depths that allow for conversion to other usages, a good ratio between the floor area and number of building access cores, aspects affording flexibility to the floor plans, a highly flexible structural design and highly adaptable technical building services. In this criterion, a maximum of 100 points can be achieved in total without bonuses, or a maximum of 110 points including bonuses. In indicator 6, **Assembly buildings** are differentiated into different building types. These types are described under the chapter "IV. Usage-specific description".

NO.	INDICATOR	POINTS
1	**Space efficiency**	
1.1	**Space efficiency**	
	Space efficiency factor: Proportion of usable floor area (UA) / gross floor area (GFA) [T&D_04]	
	Office	
	≤ 0.48 – ≥ 0.75	**1–10**
	Education	
	≤ 0.48 – ≥ 0.75	**1–30**
	Hotel	
	≤ 0.43 – ≥ 0.70	**1–30**
	Residential	
	≤ 0.60 – ≥ 0.80	**1–20**
	Consumer market	
	≤ 0.70 – ≥ 0.90	**1–20**
	Shopping centre	
	Category I: ≤ 0.55 – ≥ 0.65	**1–20**
	Category II: ≤ 0.50 – ≥ 0.60	
	Department stores	
	≤ 0.50 – ≥ 0.70	**1–20**
	Logistics and **production**	**Max. 20**
	Proportion values documented under a)	1
	Proportion values documented under a) and b) or c)	14
	Proportion values documented under a), b) and c)	20
	See "Method": a): Cost optimisation b): Environmental optimisation c): Contribution towards social optimisation	
	Assembly buildings not included	

NO.	INDICATOR	POINTS
1.2	**Multi-use of areas**	
	Assembly buildings	**20**
	The possibility of multiple use of a relevant usable building area (UA) [T&D_04] was implemented in accordance with the area utilisation concept.	20
	Office **Education** **Residential** **Hotel** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production** not included	
2	**Ceiling height**	
2.1	**Shell dimension**	
	Office	**10**
	≥ 3.00 m	
	Education	**15**
	≥ 3.00 m	
	Residential	**7–10**
	≥ 2.50 m – ≥ 2.75 m	
	Hotel	
	> 2.50 m (hotel rooms) and	**10**
	≥ 3.25 m (general areas)	
	Consumer market	**10**
	≥ 3.25 m (rented space)	
	Shopping centre	
	≥ 3.90 m (rented space)	**10**
	Logistics	
	≥ 6.00 m – ≥ 10.50 m	**5–10**
	Assembly buildings, **Production** and **Department stores** not included	
3	**Building depth**	
3.1	**Building case 1: Standard scenario (external wall – external wall)**	
	Building case 2: Building access core (external wall – core)	
	Office **Hotel**	**Max. 10**
	■ Building case 1	
	10.00 m ≤ building depth ≤ 16.50 m	5
	12.50 m ≤ building depth ≤ 14.50 m	10
	■ Building case 2	
	5.00 m ≤ building depth ≤ 8.25 m	5
	6.25 m ≤ building depth ≤ 7.25 m	10

	Residential	**Max. 10**
	■ Building case 1	
	11.50 m ≤ building depth ≤ 13.50 m, uniform building depth	5
	11.50 m ≤ building depth ≤ 13.50 m, varying building depth	10
	■ Building case 2	
	5.75 m ≤ building depth ≤ 6.75 m, uniform building depth	5
NO.	**INDICATOR**	**POINTS**
	6.25 m ≤ building depth ≤ 6.75 m, varying building depth	10
Re 3	**INNOVATION AREA** Explanation: conceptual model of alternative approaches that show that alternative building depths allow the building to be easily converted to other uses. Does not apply to **Education** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production** **Assembly buildings**	**As in 3.1**
4	**Vertical access**	
4.1	**Relationship between the gross floor area and the number of building access cores, on a per-storey basis [GFAs-storey / n building access cores]**	
	Office **Hotel** **Assembly buildings**	
	≤ 1200 m² to ≤ 400 m²	**1–10**
	Education	
	≤ 1200 m² to ≤ 400 m²	**1–15**
NO.	**INDICATOR**	**POINTS**
Re 4	**INNOVATION AREA** Explanation: Conceptual model of alternative approaches that show that the vertical infrastructure allows the building to be easily converted to other uses. Does not apply to **Residential** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production**	**See above**
5	**Floor layout**	
5.1	**Flexibility aspects of the floor plan**	
	Office	
	■ Sanitary facilities or connections (shaft) provided for retrofitting for subsequent separation into units ≤ 400 m²	**10**
	Residential	**Max. 15**
	■ The living spaces in every housing unit consist of non-dedicated rooms (e.g. 3 x 3 m, ideally 4 x 4 m)	+10
	■ Load-bearing and non-load-bearing walls within a specified structure allow the	+5

layout to be changed as required

Logistics		**Max. 20**
■	Sanitary facilities or connections (shaft) provided for retrofitting for subsequent separation into smaller units	+10
■	For separation into smaller units, separate infrastructure and use (separate billing or rental units) is possible	+10
Production		
■	For separation into smaller units, separate infrastructure and use (separate billing or rental units) is possible	**10**
Assembly buildings		**Max. 20**
■	Rooms / halls can be divided (e.g. by means of a floor-to-ceiling curtain or mobile floor-to-ceiling wall elements)	+4
■	Rooms can be used flexibly	+4
■	Sufficient storage spaces are available so that at least 50% of the rooms can be emptied	+4
■	The water supply systems and connections are designed flexible enough to retrofit area into other types of use	+4
■	The distributions and connections of the electrical equipment are designed flexible enough also for temporary events (e.g. for exhibitions or video installations etc.)	+4
■	Sanitary facilities or connections (shaft) provided for retrofitting and subsequent separation into the smaller units	+4
■	For separation into smaller units, separate infrastructure and use (separate billing or rental units) is possible	+4
■	Separate use of main usage and catering areas through different opening times / usage scenarios is possible	+4
■	Building documentation is available in a form presented in the Appendix 2 or documentation for use of a facility as an emergency shelter is available.	+4

Re 5 INNOVATION AREA

See above

Explanation: Conceptual model of alternative approaches that show that the rooms can be easily adapted for different uses.

Does not apply to

Hotel **Consumer market** **Shopping centre** **Department stores** **Education**

NO.	INDICATOR	POINTS
6	**Structure**	
6.1	**Flexibility aspects of the structure**	
	Office	**Max. 10**
	■ The majority of internal partitions is not load-bearing	+2.5
	■ Partition walls can be installed on each façade axis without intervention in the floor or ceiling	+2.5
	■ Partition walls can be re-used.	+2.5
	■ Structural engineering provides sufficient contingencies to allow for increased loads arising from potential conversions.	+2.5
	Education	**Max. 40**
	■ The majority of internal partitions are not load bearing	+10
	■ Partition walls can be installed on each façade axis without intervention in the floor or ceiling	+10
	■ Partition walls can be re-used.	+10
	■ Structural engineering provides sufficient contingencies to allow for increased loads arising from potential conversions.	+10
	Residential	**Max. 5**
	■ The majority of internal partitions are not load bearing	+2.5
	■ Shaft configuration allows for flexibility in the planning of kitchen and sanitary connections in a concentrated indoor area.	+2.5
	Hotel	**Max. 40**
	■ The majority of internal partitions are not load bearing	+10
	■ Partition walls can be installed on each façade axis without intervention in the floor or ceiling	+10
	■ Space is provided that can be flexibly separated into conference and catering areas as required.	+10
	■ Structural engineering provides sufficient contingencies to allow for increased loads arising from potential conversions.	+10
	Consumer market	**Max. 30**
	Structural engineering provides sufficient contingencies to allow for increased loads arising from potential conversions. Alternatively: the structural system permits subsequent modifications in load-bearing ceiling/wall areas (in case of interventions in the load-bearing structure, a static calculation must be carried out).	+10
	■ Installation areas are provided for tenant installations (e.g. refrigeration units) with corresponding payload/area reserve capacities.	+10
	■ There is potential for expansion (e.g. expansion of lift installations and lifting equipment) for delivery purposes. A logistics concept exists that shows the reserve capacities that can be used (e.g. when switching to new product lines/tenants).	+10

NO.	INDICATOR	POINTS
	Shopping centre	**Max. 30**
	Structural engineering provides sufficient contingencies to allow for increased loads arising from potential conversions. Alternatively: the structural system permits subsequent modifications in load-bearing ceiling/wall areas (in case of interventions in the load-bearing structure, a static calculation must be carried out).	+5
	■ Installation areas are provided for tenant installations (e.g. refrigeration units) with corresponding payload/area reserve capacities.	+5
	■ There is potential for expansion for delivery purposes. A logistics concept exists that shows the reserve capacities.	+10
	■ For remodelling, interior finishing and installation work or the adding of spatial boundaries between the rented spaces and the shopping street (shop façades), installation- and removal-friendly connection points are provided as part of the structural design of the building's interior finishing ■ Connection to the façade: In the ceiling area, there are connection possibilities for the tenant façade ■ Connection to the floor: there is a finishing strip on the floor at the boundary to the rented area ■ Connection to the sides: removal-friendly side coverings with substructure for sideways fastening of the shop façade	+10
	Department stores	**Max. 30**
	Structural engineering provides sufficient contingencies to allow for increased loads arising from potential conversions. Alternatively: the structural system permits subsequent modifications in load-bearing ceiling/wall areas (in case of interventions in the load-bearing structure, a static calculation must always be carried out).	+5
	■ Installation areas are provided for tenant installations (e.g. refrigeration units) with corresponding payload/area reserve capacities.	+5
	■ There is potential for expansion for delivery purposes. A logistics concept exists that shows the reserve capacities.	+10
	■ Rental units can be divided and remodelled without significant building work (such as changing the façade design/layout). The structural design solutions provided here are incorporated into the planning.	+10
	Logistics	**Max. 30**
	■ Building expansion can be implemented without modifying the existing load-bearing structure.	+10
	■ Expansion of the building can also be implemented vertically (e.g. supports for mezzanine floors).	+10
	■ Payload reserves for converting buildings for alternative uses have been taken into account in the structural analysis and have been provided.	+10

NO.	INDICATOR	POINTS
	Production	**Max. 20**
	■ Building expansion can be implemented without modifying the existing load-bearing structure.	+5
	■ Expansion of the building can also be implemented vertically.	+5
	■ The support grid is laid out such that sufficient spans are available should the production processes be changed or expanded.	+5
	■ Payload reserves for converting buildings for alternative uses have been taken into account in the structural analysis and have been provided.	+5
	Assembly buildings Type I and II	**Max. 25**
	■ A separation and redesign of area units of the building can be done without great structural effort (e.g. changing the facade design). Intended constructive solutions were taken into account in already the planning (e.g. in the conversion concept and / or fire protection concept).	+2.5
	■ At least one public area is equipped with a large door suitable for large exhibition items / furniture (width 2.50 mx height 2.50 m).	+2.5
	■ In the exhibition rooms / halls there is sufficient load capacity for moving and displaying large exhibition items / furniture ▪ Type I at least 2 tons of floor load ▪ Type II at least 5 tons of floor load	+2.5
	■ There is expansion potential for delivery. A logistics concept with a representation of the reserves is available.	+2.5
	Type I	
	■ There are alternative delivery routes in the building so that the assembly and dismantling of e.g. exhibition items, catering and foyer areas do not cross.	+2.5
	■ Avoidance of load-bearing interior walls	+2.5
	■ Exhibition areas have sufficiently large openings / truck gates (at least 2.50 m wide x 5.00 m high), which are suitable for passing of large exhibits / furniture.	+2.5
	■ In the exhibition rooms for multifunctionality the payload reserves to transfer large exhibition items are available as well for the ground floor (at least 2 tons)	+2.5
	■ The walls are designed in a way that they can withstand the constant change of exhibition items, i.e. walls are robust, easy to repair and easy to paint	+2.5
	■ The gradation in the auditorium can be changed without interfering with structural components, as e.g. the platforms are designed as built-in components.	+2.5
	Type II	
	■ Every hall and every divisible area of the hall has at least one truck gate with the following minimum dimensions:	
	▪ at least two truck gates (each divisible area at least one truck gate) with a width ≥ 4.0m x 5.0 m)	+2.5
	▪ at least two truck gates (each divisible area at least one truck gate) with a width ≥ 5.0 mx 5.0 m)	+5
	■ The load capacity of the ground floor level is suitable for trucks to drive through.	+1 – 5
	▪ The static design is carried out up to ≥ heavy goods vehicles of 30 t	+1
	▪ The static design is carried out up to ≥ heavy goods vehicles of 60 t	+5
	■ Suspension loads of the ceiling construction of the main usable area for the trade fair installations have to be considered in the following way:	

- Suspension points with a maximum individual load of 5kN and a resulting surface load of 0.2 kN / m² +2.5
- Suspension points with a maximum individual load of 10kN and a resulting surface load of 0.3 kN / m² +5

Re 6	**INNOVATION AREA** Explanation: conceptual model of alternative approaches that show that the structural design is flexible.	**See above**

7 Technical building services

7.1 Flexibility aspects of the technical building services

Office Residential Consumer market	**Max. 40**
Production	**Max. 50**
Logistics	**Max. 20**
Assembly buildings	**Max. 25**

In case of modifications in the room situation or restructuring the distribution systems and connections can be adapted.

7.1.1	Ventilation/HVAC		**+Max. 10**
		Assembly buildings	**+Max. 5**
	▪ Only with significant structural amendments		1
	▪ With minor structural amendments		7
		Assembly buildings	2.5
	▪ Does not require structural amendments		10
		Assembly buildings	5
7.1.2	Cooling		**+Max. 10**
		Assembly buildings	**+Max. 5**
	▪ Only with significant structural amendments		1
	▪ With minor structural amendments		7
		Assembly buildings	2.5
	▪ Does not require structural amendments		10
		Assembly buildings	5
7.1.3	Heating		**+Max. 10**
		Assembly buildings	**+Max. 5**
	▪ Only with significant structural amendments		1
	▪ With minor structural amendments		7
		Assembly buildings	2.5
	▪ Does not require structural amendments		10
		Assembly buildings	+5
7.1.4	Water – Vertical WC connections		**+Max. 10**
		Assembly buildings	**+Max. 5**
	▪ Only with significant structural amendments		1
	▪ With minor structural amendments		7
		Assembly buildings	2.5
	▪ Does not require structural amendments		10

		Assembly buildings	+5
	Production		**+Max. 10**
	Assembly buildings		**+Max. 5**
7.1.5	Electrics		
	■ Only with significant structural amendments		1
	■ With minor structural amendments	**Production**	7
		Assembly buildings	2.5
	■ Does not require structural amendments	**Production**	10
		Assembly buildings	5

NO.	INDICATOR	POINTS
	Logistics Heating and electrics only	
	Shopping centre	**Max. 40**
	Department stores	**Max. 50**
	QL 1: The building services are in the form of a fixed transfer point for the rental units. Adaptation work may be necessary if the room situation is changed, or if the room or building is remodelled. Adjustment/regulation work has been undertaken; distribution and generation reserve capacities are not retained. QL 2: The building services are configured such that, thanks to distribution reserve capacities, it is easier to respond to increases in demand, e.g. an increase in power if the room situation is changed, or if the room or building is remodelled. QL 3: The building services are configured such that, thanks to generation and distribution reserve capacities, it is very easy to respond to increases in demand, e.g. an increase in power if the room situation is changed, or if the room or building is remodelled.	
7.1.6	Cooling: Cooling supply system	**+Max. 10**
	■ QL 1	1
	■ QL 2	6
	■ QL 3	10
7.1.7	Heating: Heating supply system	**+Max. 10**
	■ QL 1	1
	■ QL 2	6
	■ QL 3	10
7.1.8	Water: Water supply and waste water system	**+Max. 10**
	■ QL 1	1
	■ QL 2	6
	■ QL 3	10
7.1.9	Electrics: Electricity supply system	**+Max. 10**
	■ QL 1	1
	■ QL 2	6
	■ QL 3	10
	Department stores	
7.1.10	Ventilation/HVAC	**+Max. 10**

- QL 1 rental units 1
- QL 2 distribution systems and connections 6
- QL 3 generation systems, distribution systems and connections 10

Re 7 **INNOVATION AREA** — See above

Explanation: Conceptual model of alternative approaches that show that the technical building services are flexible.

Does not apply to **Education** **Hotel**

NO.	INDICATOR	POINTS
8	**CIRCULAR ECONOMY BONUS – HIGH INTENSITY OF USE** Explanation: For a significant proportion of the building's usable area (at least 50%), area usage concepts that allow for a higher intensity of use in terms of a higher number of users and different usage times have been implemented (e.g. hot desking/desk sharing, business club, etc.)	+10

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The space efficiency factor, the ceiling height in the shell state, the building depth and the gross floor area/number of building access cores are good key performance indicators (KPIs) to report. For the EU's Level(s) reporting framework [T&D_02], information from the designers on support spacing, wall systems and area layout can be used.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Proportion of usable floor area (UA) / gross floor area (GFA) [T&D_04]	[m²/m²]
KPI 2	Shell dimension	[m]
KPI 3	Building depth	[m]
KPI 4	Gross floor area (GFA) [T&D_04] / number of building access cores	[m² GFA]
KPI 5	Flexibility for the user: Support spacing [m], non-load-bearing internal wall system [flexible/inflexible], potential for areas to be divided [m²], in accordance with Level(s), indicator 2.2 (Level 1) [T&D_02]	[-]

Synergies with DGNB system applications

- **DGNB DISTRICTS:** The information on the GFA [T&D_04] can be used in criterion ECO2.3 from the schemes for urban districts and business districts.
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion ECO2.1 from the scheme for renovated buildings.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

–

II. Additional explanation

Technical and social developments impact on the built environment for work, housing and leisure. This requires highly efficient, flexible and adaptable buildings. The need for adaptation may arise from changes within the building use, or by conversion to a different use (e.g. by a new tenant).

In economic terms, the evaluation of the building's space efficiency is based on the proportion of usable and rentable space in relation to the total area of the building.

This criterion is closely related to TEC1.4, which is focused on the adaptability of technical systems.

III. Method

Definitions

Space efficiency is assessed from an economic point of view. As an indicator of how cost-effective the use of the space is, the relationship between usable/rentable areas and the total area of the building is taken into consideration.

Flexibility:
The slight adaptation of the building structure to changes still within the existing use (e.g. individual offices becoming open-plan offices – a fulfilment centre becoming a warehouse)

Suitability for conversion:
The adaptation of the building structure to a different use (e.g. office use to hotel use, logistics facility to production facility)

The following indicators are evaluated:

Building geometry:
Indicator 1: Space efficiency
To determine how efficiently the space is used, in accordance with the scheme and common practice in the market segment, the proportion of the GFAs [T&D_04] that can be considered usable area (as per the relevant definition) is calculated as follows:

UAs / GFAs [T&D_04]
For this purpose, the following must be noted:

- Circulation areas within units that can be used without restriction are part of the usable area.
- Necessary corridors leading to emergency exit stairwells used by two units are part of the circulation

area.
- Corridors within a unit leading to an emergency exit stairwell are part of the usable area (exclusive use by one unit).
- Foyer areas for which there is evidence that they can be used as assembly buildings (provided they comply with the requirements of the building regulations) can be wholly included as part of the usable area.

When calculating the space efficiency factor, it is rounded to two decimal places.

Indicator 1.2: Multi-use of areas
(only for **Assembly buildings**)

The diverse usability of buildings is already determined in the first planning phases. Multiple use concepts of areas (space sharing concepts) enable an increase in the intensity of use and a reduction in land consumption. If the planning creates the prerequisites that building areas can be used by different types of use and if the associated functionalities are taken into account in the planning, then sharing concepts can create ecological, social and economic opportunities for building or room users / building owners and operators. In addition to spatial structures, intelligent sharing concepts also require (management) systems and structures that regulate access to rooms and the necessary facility management.

If concept of multi-purpose area uses as well as the plan for building area optimization/utilisation was implemented in the planning and the execution phases, with involvement of (specialist) planners and, if necessary, user groups, this will lead to positive evaluation. In addition, clarification and assignment of liabilities, tenancy and property regulations into the corresponding (rental) contracts will fulfil the requirements of optimal building use.
It is assessed whether the usage concept has been implemented for a relevant portion of the usable building area. The relevance of certain use must be presented and justified based on the building type.
Building use-concept have to address at least the following topics:
- Types of use (as well as consideration of special requirements for these uses)
- User groups
- Utilization concept (beyond the regular usage times of the main usage)
- Room booking platforms / access management systems
- Requirements for facility management

The "DGNB Report Circular Economy", which among other things contains a checklist for the multiple use of buildings, provides assistance.

Shopping centre

Category I: Plots with simple requirements

- 1–2 storey retail buildings plus 1 additional use level (parking, office, etc.) and
- Few urban planning requirements

Category II: Plots with significant requirements

- Building with ≥ 3 sales levels plus 2 additional use levels (parking, office, etc.) or
- Major urban planning restrictions or
- Challenging plots that require a high proportion of access and circulation areas (e.g. in parallel,

round and triangular shopping centres)

Logistics **Production**

Proportion values documented:

- a): Cost optimisation: The construction and operating costs are reduced by efficient area layout; the areas that are difficult to use are dispensed with
- b): Environmental optimisation: The environmental impact of running a property is decreased by reducing the heating, ventilation and cooling system equipment on the premises (through high space efficiency, the sealing of natural soils can be reduced.)
- c): Contribution towards social optimisation: The working environment is positively influenced by well-proportioned spaces and a clear layout (e.g. connecting office and social areas, clearly laid out mezzanine floors, optimised circulation routes)

Indicator 2: Ceiling height
In a project, the height can either be determined from the plans or by measuring. If the room height varies within a room, e.g. in the attic, the average room height must be used.
A standard floor must be defined and applied for the evaluation. Where it is not possible to clearly define a standard floor, documentary evidence must be provided to prove that 80% of the area complies with the height used for the evaluation. Service storeys and underground car park are to be disregarded for the purposes of this aspect of this assessment.

In this criterion, the ceiling height is the shell **dimension** = upper edge of the unfinished floor to the lower edge of the bare ceiling.

Indicator 3: Building depth
A standard floor must be defined and applied for the evaluation.
The building depth must be available between the two façades of the standard floor for 70% of the usable area. The rooms to be assessed are highlighted in bold in Annex 1 of this criterion.
The building depth can either be determined from the plans or, depending on the progress of the construction work, by measuring.

There are two different scenarios:

Scenario 1: As a general rule (with single-loaded or multi-loaded infrastructure), the entire building depth is measured from the inner edge of one external wall to the inner edge of the opposite external wall.

Scenario 2: Near building access cores (e.g. in point (tower) blocks and frontage buildings), the building depth is measured from the front of the core, that is to say, it is the distance between the outer edge of the core wall and the inner edge of the external wall.

Exceptional cases must be presented and assessed in line with scenario 1 or 2.

Documentary evidence regarding floor plan layout:
If the building depths in the building differ from those listed for building case 1 and building case 2 and if the architect commissioned has drawn up a concept that makes the building flexible and suitable for conversion, this can be used

as documentary evidence for the indicator. The concept must show the building's flexibility and suitability for conversion to other conceptual approaches (e.g. in the case of offices: open-plan, cellular, combination office layouts).

Potential for division into multiple units:

Indicator 4: Vertical access

The placement of stairs and lifts has an influence on the building's flexibility in terms of the possible unit sizes and the scope for efficient access to other uses such as offices or residential. The GFAs [T&D_04] of the typical floor plan per vertical access core should be calculated. The smaller this ratio is, the easier it is to subdivide the building into smaller units. Only fire escape access cores should be considered. In buildings with more than three floors, only access cores with lifts should be considered.
Exceptional cases must be clearly and logically presented and evaluated.

Indicator 5: Floor layout– Flexibility aspects of the floor layout

Depending on the layout, subsequent subdivision into smaller units may require additional sanitary units.
These should be provided from the outset, or relevant service access should be put in place in order to facilitate their subsequent addition.
It should be possible to convert the building services without significant structural amendments (e.g. zoning thermo-active building components).

Indicator 6: Structure

The structural design is examined in terms of individual components, the quality of which influences the conversion of buildings:

- internal walls
- partition walls
- load reserves

Indicator 7: Technical building services

The adaptability of the technical building services is examined on the basis of the following parameters:

- ventilation/HVAC
- cooling
- heating
- water
- electrics

For this indicator, the amount of structural amendments required in terms of remodelling/changes to rooms within the individual units (flexibility) is taken into consideration. If any of the services under evaluation is not present, points can be awarded.

Definitions:

- **Significant structural amendments** = e.g. requires masonry work or the removal of reinforced concrete building components
- **Minor structural amendments** = assembly openings, doors and corridors are sufficiently large and

are adequately provided. Accessibility is good. Components can be transported and replaced, e.g. through dry construction work.

Indicator 8: CIRCULAR ECONOMY BONUS - high intensity of use

Land use concepts have been implemented for a significant proportion of the building's usable area, which enable a higher intensity of use in relation to a higher number of users and different usage times (e.g. based on a utilization concept beyond the regular usage times of the main use). The land use concept supports the diverse use and optimization of the building load (e.g. through non-territorial offices / desk sharing, business club). It is assessed whether the present usage concept has been implemented for at least 50% of the usable area. Checklists in the DGNB Report Circular Economy (see www.dgnb.de/de/themen/circular-economy/index.php) can support the creation of such concepts.

IV. Usage-specific description

-

Indicator 1: Space efficiency

Certain factors (such as number of floors, access points etc.) can have a significant impact on the space efficiency of buildings. Therefore, certain factors in different schemes have to be taken in account:

Shopping centre

Category I: plot of land with simple requirements

- Buildings with 1-2 storey sales area and 1 additional usage (parking, office, etc.) and
- low urban planning requirements

Category II: plot of land with high requirements

- buildings with ≥ 3 storey sales area and 2 further usage (parking, office, etc.) or
- large urban planning restrictions/limitations or
- Difficult property layouts that require a high proportion of access areas (e.g. parallel mall, round mall, triangle)

Logistics **Production**

Documentation of ratio values:

- a): Cost-related optimization: Reduction of construction and operating costs through efficient division of space, poorly usable spaces are avoided
- b): Environment-related optimization: Reduction of the environmental impact of a property in operation by reducing the heating, ventilation and cooling system technology of the premises. With an increased area efficiency, the sealing of natural soils can be reduced.
- c): Contribution to optimization in the social area: positive influence on the working environment through well-proportioned areas and clear design (e.g. connection of office and social areas, clear mezzanine areas, optimized traffic routes)

Indicator 5: Floor layout– Flexibility aspects of the floor layout

Assembly buildings

Functionality of some Assembly buildings require large openings (e.g. elevators, passageways, entrances) to enable accommodation of the large items and/or furniture. Elevators, exhibition and traffic areas are to be designed with extra load bearing capacities e.g. for heavy exhibition units / furniture / tribunes. The possible use of a Assembly buildings as an emergency shelter can be evaluated positively if an appropriately prepared project documentation is available.

Indicator 6: Structure

Assembly buildings

For the assessment in this indicator, Assembly buildigns are divided into the following building types:

- Type I: Congress buildings, theatres and concert halls, museums, cultural, civic centres and libraries
- Type II: Trade fair and city halls

Note: Assembly buildings that are not listed here as a building type, can be assigned to one of the above-mentioned types. If an assignment is not possible, we ask for direct communication with the DGNB office.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The allocation of points for individual indicators must be backed up by comprehensive and plausible evidence.

Indicator 1: Space efficiency

- Calculation of the UAs [T&D_04] and a list of related floor space
- Calculation of the GFAs [T&D_04] and a list of related floor space
- Calculation of the space efficiency factor

Indicator 1.2: Multi-use of areas
(only for **Assembly buildings**)

- Concept for the multiple use of areas with information on different uses, user groups and regulations on aspects of liability and tenancy and property law;
- Representation in floor plans as well as details of the areas that allow multiple uses, with explanations of types of use and user groups;
- Utilization concept;
- Description of the supporting management systems;

Indicator 2: Ceiling height

- Presentation of the heights using extracts from the cross-sectional plans

Indicator 3: Building depth

- Presentation of the building depth using floor plans and/or cross-sectional plans with explanations and a list of the related floor areas
- Documentary evidence regarding floor plan layout: Concept (architect) that shows alternative approaches for making the building flexible and suitable for conversion using floor plans and sections with a brief written and conceptual justification

Indicator 4: Vertical access

- Presentation in floor plans with explanations
- Calculation of the ratio GFAs [T&D_04] / number of building access cores

Indicator 5: Floor layout

- Presentation using floor plans with explanations
  Assembly buildings Prepared project data according to the Appendix 2 or corresponding plan documentation for use as an emergency shelter

Indicator 6: Structure

- Presentation of the load-bearing and non-load-bearing components using floor plans with explanations
- Photo documentation with explanations
- Detailed drawings of the ceiling and floor connections, proof of product
- Plausible proof of the calculation of payload reserves

Indicator 7: Technical building services

- Excerpts from the technical building services plans with reference to distribution systems and connections for ventilation/HVAC, cooling, heating and sanitary systems with explanations
- Photo documentation with explanations

Indicator 8: CIRCULAR ECONOMY BONUS - high intensity of use

- Use concept for the multiple use of areas with details of different uses
- Representation in floor plans with details of the areas and explanations of types of use and user groups
- Utilization concept
- Photo documentation with explanations

APPENDIX C – LITERATURE

I. Version

Change log based on Version 2018

PAGE	EXPLANATION	DATE
all	General, Evaluation, Method and documentation: scheme “Assembly buildings” has been added	16.09.2021
297	Appendix 2 for the project documentation has been added	16.09.2021
all	Evaluation and documentation for Indicator 8: additional information / clarification has been added	16.09.2021

II. Literature

- ISO 9836:2017: https://www.sis.se/api/document/preview/922406/

Annex 1

Indicator 3: Building depth

The rooms to be assessed are highlighted in bold (see also [T&D_04])

SCHEME	TYPE OF USABLE FLOOR AREA (UA) FOR WHICH DOCUMENTARY EVIDENCE IS REQUIRED FOR INDICATOR 3	
	USE GROUP	FLOOR AREAS AND ROOMS
Office	2 – Office work	**2.1 Office rooms** **2.2 Open-plan offices** 2.3 Meeting rooms 2.4 Design rooms 2.5 Rooms with counter(s) (e.g. ticket office) 2.6 Control rooms 2.7 Surveillance rooms
Consumer market **Shopping centre**	4 – Sales and distribution (excl. storage)	4.4 Acceptance and distribution areas (where these are permanent working areas) **4.5 Sales rooms** 4.6 Showrooms 3.2 Workshops (where these are permanent working areas)
Logistics **Production**	2 – Office work (with proportion of administration)	**2.1 Office rooms** **2.2 Open-plan offices** 2.3 Meeting rooms 2.4 Design rooms 2.5 Rooms with counter(s) 2.6 Control rooms 2.7 Surveillance rooms
	3 – Production, manual and machine work, experiment (with proportion of industrial work)	**3.1 Workshops (where these are permanent working areas)** 3.2 Technological laboratories 3.3 Physics, engineering physics and electrical engineering laboratories 3.4 Chemistry, bacteriology and morphology laboratories

Residential	1 – Residing and occupying	**1.1 Living spaces** 1.2 Common rooms 1.3 Break rooms 1.4 Waiting rooms 1.5 Dining rooms
Hotel	1 – Staying and occupying (with percentage of hotel rooms)	**1.1 Living spaces** 1.2 Common rooms 1.3 Break rooms 1.4 Waiting rooms 1.5 Dining rooms
	2 – Office work (with percentage of offices)	2.1 Office rooms
Education	5 – Education, teaching and culture	**5.1 Classrooms with fixed seating** **5.2 General classrooms and practice rooms without fixed seating** 5.4 Dedicated classrooms and practice rooms without fixed seating 5.5 Library rooms 5.6 Assembly rooms or areas 5.7 Stages, studios 5.8 Exhibition rooms

APPENDIX 2

Project details (according to Düsseldorf district government. Emergency shelters of the state of NRW: Requirements for structural facilities).

Object details	
Location: ☐ Corridor, parcel, district	
Building type: ☐Hall, administration building, house	
Owner: ☐Address & contact details	
Operator: ☐Address & contact details	
Supervision association: ☐Address & contact details	
Security service: ☐Address & contact details	
Building management: ☐Address & contact details	
Current building permit: ☐use	
Entry with connivance possible	
Move-in date	
Requirements for use: ☐Leasing, green waste, etc.	
Service life	
Suitability as emergency accommodation	
Area of the site: ☐Length measure for fencing	
Expansion possible	
Contact person circle	
Construction supervision: ☐Accessibility (phone & E-Mail)	
Fire protection department: ☐Accessibility (phone & E-Mail)	

Health Department: ☐Accessibility (phone & E-Mail)	
Contact municipality	
Construction supervision: ☐Accessibility (phone & E-Mail)	
Fire protection department: ☐Accessibility (phone & E-Mail)	

Health Department: ☐Accessibility (phone & E-Mail)		
		Remarks
Enclosure existing:		
Soil contamination:		
Soil condition:		
Drainage wastewater:		
Vegetation:		
Extension areas:		
	Infrastructure - plans available?	**Attached as Annex 1, 2, 3 ...**
Drinking water pipe network:	☐	☐
Sewage pipe network:	☐	☐
Power lines:	☐	☐
Gas pipe:	☐	☐
Telecommunications:	☐	☐
	Supply and plumbing	**Remarks**
Drinking water:		☐
Electricity:		☐
Lighting on the site:		☐
Lighting in buildings:		☐
Kitchen & Cooking:		☐
Sewage sewer connection:		☐
Waste water container solution:		☐
Showers (1x / 10 people):		☐
Number of toilets: 1 toilet per unit (6-10 people)		☐

washroom:		☐
Object or area specification		
Access (construction vehicles 34 t):		
Alternative (access)		
Outskirts:		
Industrial Estate:		

Industrial area:		☐
Nature reserve:		☐
Water protection area:		☐
Distance to rail traffic:		☐
Distance to motorway:		☐
Distance to inland shipping:		☐
Defensive fire protection		
Responsible municipality:		
Arrival times at the object:		
Number of employees		
Extinguishing water supply:		
Manpower requirements Details can be found in the service description about standards of accommodation facilities in North Rhine-Westphalia		
Management:		
technical staff:		
Medical corps:		
Security staff:		
Supervising staff:		
Initiated or necessary procurement		
Residential and office container:	☐	
Thermal insulation winter: roofing and floor for tent or container	☐	
Lighting:	☐	
Buildings and warehouses	☐	

Fabrics and tarpaulins for hanging out the private areas	☐
Stand walls / exhibition boxes:	☐
Number of beds:	☐
Number of chairs:	☐
Number of tables:	☐
Number of desks:	☐

Number of office chairs:	☐
Number of filing shelves:	☐
Number of storage shelves:	☐
Smoking area:	☐
Privacy protection outside:	☐
Sports, leisure & religion	
Play opportunities - children:	☐
Space for religion and culture:	☐
Table tennis:	☐
Multimedia:	☐
Ball sports:	☐
Others:	☐
Offices / organizations already involved in the planning	
Authorities:	
Integration:	
Representative religion:	
Psychosocial support:	
separate victim support:	
Other institutions:	

Further building information		
Spaces	**Number**	**m² per room**
Bedroom		
Common room		

management		
storage		
First aid room		
quarantine		
Gate		
childcare		
Classroom		
Clothes closet		
staff		
Supply / technology		
Dining room		
Tea kitchen		
big kitchen		
Social space		
Sports		
Prayer room		
TV & Internet		

Technical requirements	
Fire alarm system (FAS) Category, DIN, activation control center	☐
Maintenance according to Test-Building Ordinance expert FAS carried out? Operational safety,	☐
Plant fire protection Sprinkler system, wall hydrants	☐
Organizational fire protection Fire protec-tion regulations Fire protection officer	☐
Structural fire protection requirements of building law are complied with	☐

Known deviations **Building permit**	.
Showers (1/10)	
Toilets (1/10)	
Escape and emergency routes	
Flooring Carpet, concrete, PVC etc.	
Room separation (privacy)	

ECO2.2

Commercial viability

Objective

Our objective is to create buildings with maximum user acceptance and long-term market potential.

Benefits

Unused buildings constitute a misallocation of financial resources. A building that stands empty (in the medium or long term) is not sustainable. In order to achieve good commercial viability, a property must maintain or even increase its value, making it substantially easier to position it on the market.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Low	8.4	Improve resource efficiency in consumption and production	7.1.a/b	Resource conservation
			8.1	Resource conservation
	12.2	Sustainable management and use of natural resources	11.1.a/c	Land use
	12.5	Substantially reduce waste generation		

Outlook

The significance and score are expected to remain the same.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Assembly buildings	5.0%	2
Production	0.0%	0

EVALUATION

The commercial viability is essentially evaluated on the basis of the market and site aspects. The aim here is to establish the extent to which the building and its uses are geared towards market and site requirements. The objective is not to undertake an absolute analysis of the site or the market, but rather to evaluate the property quality, site aspects and market characteristics in relation to one another. The commercial viability can be described by addressing the topics of "Site and image", "Entrance situation, routing and signposting", "Parking space situation", "Market risk" and "Occupancy rate". 100 points can be awarded for this criterion, or a maximum of 110 points including bonus points.

NO.	INDICATOR	POINTS
1	**Entrance situation, routing and signposting**	
1.1	**Entrance situation**	
	Office **Residential** **Hotel** **Shopping centre** **Department stores** **Consumer market**	
	■ Readily identifiable and easy to find	**7.5**
	Education **Assembly buildings**	
	■ Readily identifiable and easy to find	**10**
	Logistics	
	■ Readily identifiable and easy to find	**5**
1.2	**Routing and signposting**	
	Office **Residential** **Hotel** **Shopping centre** **Department stores** **Consumer market**	
	■ Routing/markings provided, discernible and comprehensible (building name, house number, building entrance, car/HGV entrance/parking spaces)	**7.5**
	Education **Assembly buildings**	
	■ Routing/markings provided, discernible and comprehensible (building name, house number, building entrance, car/truck entrance/parking spaces)	**10**
	Logistics	
	■ Routing/markings provided, discernible and comprehensible (building name, house number, building entrance, car/HGV entrance/parking spaces)	**5**

NO.	INDICATOR	POINTS
2	**Parking space situation**	
2.1	**Delivery zone**	
	Office **Hotel** **Shopping centre** **Department stores** **Consumer market**	
	■ Designated parking spaces in the immediate vicinity of the main entrance or delivery entrance	**7.5**
	Education [1]	
	■ Designated parking spaces in the immediate vicinity of the main entrance or delivery entrance	**10**
	Shopping centre **Department stores** **Logistics**	**Max. 15**
	■ Separate entrances for passenger cars and HGVs	+7.5
	■ There are no restrictions on using the delivery zone and this does not affect ongoing operations	+7.5
	Logistics	
	■ The delivery zone can be used and accessed 24 hours a day (approval has been granted for this).	**15**
	Assembly buildings	**Max. 10**
	■ Separately designated parking spaces in the immediate vicinity of the main entrance or delivery entrance	+2.5
	■ There is a separation of the access routes for cars and trucks	+2.5
	■ The delivery zone is freely accessible without impairing further operations	+2.5
	■ Usage and accessibility of the delivery zone is guaranteed 24 hours a day (approval is available)	+2.5
2.2	**Drop-off and pick-up areas**	
	Education	
	■ Up to 50 m from the main entrance (Kiss & Ride)	**7.5**
	Hotel	
	■ For dropping off and picking up guests and their luggage up to 50 m from the main entrance	**7.5**
	Assembly buildings	**Max.17.5**
	■ Distance to public transport (station/stop) is at max. of 200 m from the main entrance	+10
	■ It is possible to park tour buses at a max. distance of 200 m from the main entrance or side entrance. Number of the parking options correspond to the estimated needs for the building	+7.5

[1] For a campus with multiple educational buildings or a common parking space solution for multiple buildings, the parking spaces allocated to the building must be included in the calculation.

NO.	INDICATOR	POINTS
2.3	**Passenger car parking space capacity allocated to the building**	
	≥ 1 private car parking space per ...	
	Office **Education**	1 – 10
	■ ≥ 200 m² office area (UA-2) [T&D_04]	**1**
	■ ≥ 50 m² office area (UA-2) [T&D_04]	**10**
	Residential	5 – 10
	■ 2 housing units	**5**
	■ 1 housing unit	**10**
	Hotel	**1 – 7.5**
	■ 5 rooms	**1**
	■ 2 rooms	**7,5**
	Assembly buildings	**Max.12.5**
		+1 – 5
	≥ 1 parking space for every 10 visitors or seats	1
	≥ 1 parking space for every 5 visitors or seats	5
	A sufficient number of parking spaces for night liners with the appropriate power supply, in accordance with the building usage concept, is available	+7.5
	Shopping centre	**2–7.5**
	Location 1: On a greenfield site (moderately good public transport links)	
	■ ≤ 40 m² sales area (UA-4.5) [T&D_04]	2
	■ ≥ 20 m² sales area (UA-4.5) [T&D_04]	7,5
	Location 2: In the town/city centre (good public transport links)	
	■ ≤ 80 m² sales area (UA-4.5) [T&D_04]	2
	■ ≤ 40 m² sales area (UA-4.5) [T&D_04]	7,5
	Logistics	
	■ 3 employees	**7.5**
	Consumer market	**Max. 7.5**
	Location 1: On a greenfield site (moderately good public transport links)	**2–7.5**
	■ ≤ 40 m² sales area (UA-4.5) [T&D_04]	2
	■ ≤ 20 m² sales area (UA-4.5) [T&D_04]	7.5
	Location 2: In the town/city centre (good public transport links)	**2–7.5**
	■ ≤ 80 m² sales area (UA-4.5) [T&D_04]	2
	■ ≤ 40 m² sales area (UA-4.5) [T&D_04]	7.5
	Department stores	
	Location: In the town/city centre (good public transport links)	**2–7.5**
	■ ≤ 80 m² sales area (UA-4.5) [T&D_04]	2
	■ ≥ 20 m² sales area (UA-4.5) [T&D_04]	7.5

NO.	INDICATOR	POINTS
2.4	**Bicycle parking capacity allocated to the building**	
	Hotel **Shopping centre** **Department stores** **Consumer market** **Assembly buildings**	
	■ 100% of the required bicycle parking bays according to the parking space standard documentation have been provided or the number provided is in line with the number specified in the local standards/regulations for required bicycle parking, if no local regulation exists alternately, report from the European Cyclists´ Federation (ECF) can be applied	**10**
	Office **Education** **Residential**	
	■ 100% of the required bicycle parking bays according to the parking space standard documentation have been provided or the number provided is in line with the number specified in the local regulations for required bicycle parking, if no local regulation exists alternately, report from the European Cyclists´ Federation (ECF) can be applied	**15**
2.5	**Public parking spaces 200 m from the main or side entrance**	**Max. 15**
	≥ 1 passenger car parking space per ...	
	Office **Residential** **Hotel** **Shopping centre** **Department stores** **Consumer market** **Education**	
	■ 500 m² GFAs [T&D_04]	7.5
	■ 200 m² GFAs [T&D_04]	15
2.6	**Public parking spaces 500 m from the delivery entrance**	
	≥ 1 HGV parking space per ...	
	Logistics	
	■ 10 – 5 entrance gates	**1–7.5**
2.7	**Number of entrance gates**	
	≥ 1 entrance gate per …	
	Logistics	
	■ 2000 m² - 500 m² UA 4 [T&D_04]	**1–15**
2.8	**Number of underground parking spaces**	
	Residential	
	■ The majority of the passenger car parking spaces allocated to the building are underground	**7,5**
Re 2	**INNOVATION AREA**	**As in 2.1–2.7**
	Explanation: Modelling of alternative approaches that show that the desired aspects with regard to the parking space situation have been achieved another way.	
3	**Market characteristics**	
3.1	**Market risk**	
	Office	**1–22.5**
	■ High:	1
	- Relationship (in %) between the planned area and the existing office area NFA [T&D_04] in the relevant sub-market, which is ≤ 10% or:	
	- Relationship (in %) between the planned area and the average rental performance (turnover per unit of area) per year for:	

- The top 7 most populated cities in the country ≤ 100% in the relevant sub-market in the city
- The next 8 to 14 of the most populated cities in the country ≤ 60% in the relevant (sub-)market
- Other cities with more than 100,000 inhabitants ≤ 40%
- Towns with fewer than 100,000 inhabitants ≤ 30%

- Low: 22.5
  - Relationship (in %) between the planned area and the existing office area NFA [T&D_04] in the relevant sub-market, which is ≤ 1% or:
  - Relationship (in %) between the planned area and the average rental performance (turnover per unit of area) per year for:
    - The top 7 most populated cities in the country ≤ 50% in the relevant sub-market in the city
    - The next 8 to 14 of the most populated cities in the country ≤ 30% in the relevant (sub-)market
    - Other cities with more than 100,000 inhabitants ≤ 20%
    - Towns with fewer than 100,000 inhabitants ≤ 15%

Residential **Hotel** **Consumer market** **1–22.5**

- High: An expert report or market analysis finds that there is only very limited market potential for the planned project in its segment 1
- Low: An expert report or market analysis finds that there is excellent market potential for the planned project in its segment 22.5

Shopping centre **Department stores** **Logistics** **Assembly buildings** **1–15**

- High: An expert report or market analysis finds that there is only very limited market potential for the planned project in its segment 1
- Low: An expert report or market analysis finds that there is excellent market potential for the planned project in its segment 15

Re 3 **INNOVATION AREA** **As in 3.1**

Explanation of an innovation area: Modelling of alternative approaches that show that the market risk/market potential is known

Indicator does not apply to **Education**

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4 Degree of utilisation/units let at the time of completion

4.1 Degree of utilisation/occupancy rate

Office **Residential** **Hotel** **Shopping centre** **Department stores** **Logistics** **Assembly buildings**

- 50%–100% **1–15**

Education **Consumer market**

- 50%–100% **1–22.5**

4.2 CIRCULAR ECONOMY BONUS – CIRCULAR ECONOMY USERS, TENANTS OR HIRERS **+10**

Explanation: At least one company/party actively contributes to a circular economy as users/tenants of the building. This occurs in the building itself or at the site by means of joint material flow management or similar forms of collaboration with another company/party in the near vicinity of the building.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The car parking space capacity allocated to the building, the relationship between the planned area and the existing buildings, and the degree of utilization are good key performance indicators (KPIs) to report. For the EU's "Level(s)" reporting framework [T&D_02], general information about the building can be obtained from the information relating to the criterion.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Capacity of car parking space allocated to the building (PS)	[passenger car PS/unit]
KPI 2	Capacity of bicycle parking space allocated to the building	[bicycle PS/unit]
KPI 3	Capacity of car/HGV parking space available to public	[passenger car/HGV PS/unit]
KPI 4	Relationship between the planned area and the existing buildings in the sub-market	[%]
KPI 5	Degree of utilisation/occupancy rate	[%]
KPI 6	Year of construction of the building, the building's planned service life, building geometry, usable floor area, market segment in accordance with the BOMA classification, in accordance with basic information on the building in "Level(s)" [T&D_02]	[-]

Synergies with DGNB system applications

- **DGNB OPERATION:** The information on the occupancy rate can be used in criterion 9.1 from the scheme for buildings in use.
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion ECO2.2 from the scheme for renovated buildings.
- **DGNB DISTRICTS:** Information from the market and site analysis can be used in criterion ECO2.4 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

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II. Additional explanation

The commercial viability of a property manifests itself through investment and rental decisions. These ultimately form the basis for the continued use of the property in question throughout its entire life cycle.
If the site and property quality of a building is above the usual market standard, it can be assumed that the building is highly commercially viable and that the vacancy risks are therefore low. In contrast, below average site and property quality results in reduced commercial viability and limited rental potential. Under such circumstances, both value stability and rental income suffer.

III. Method

Indicator 1: Entrance situation, routing and signposting
This indicator is evaluated by assessing the entrance situation, routing and signposting.

- Entrance situation: The quality of the entrance situation can be divided into buildings with an entrance that is easily discernible and easy to find, buildings with an entrance that is only indirectly discernible (e.g. hidden due to secondary positioning or for other reasons) and/or buildings for which the property is composed of an ensemble of buildings. Buildings that are easily discernible and easy to find will be reflected positively in the evaluation.
- Routing and signposting: The presence of routing, signposting, markings or a navigation system for the building´s outdoor area that allows visitors to easily find the building's entrance, the passenger car/HGV entrance and the parking spaces will be reflected positively in the evaluation. In addition to the house number, other means of identification are often used for an individual building, an ensemble of buildings or a building complex with different entrances. If such means are used to identify the desired entrance, the assessment must evaluate whether they have been displayed at the building entrance in question in such a way that they are discernible (distinct) and easy to find and are used to facilitate navigation by the user, including in the outdoor area.

Indicator 2: Parking space situation
This indicator is evaluated by assessing the delivery zone and the parking space situation.

- Delivery zone:
  A delivery zone that can be used without restriction and without affecting ongoing operations, and a designated parking area for delivery vehicles in the immediate vicinity of the main entrance or delivery entrance, will be reflected positively in the evaluation. Separate entrances for cars and HGVs will also be evaluated positively as this prevents traffic hold-ups.
- Parking space capacity allocated to the building on a plot of land/in the building: The assessment will evaluate whether there are passenger car parking spaces allocated to the building on a plot of land and/or in the building. Parking spaces that are verified under building and planning law are credited

in the same way as for the parking spaces allocated to the building. If, during the building permit process, the planning authority requests for a mandatory parking space charge, this can be submitted as alternative documentary evidence. A voluntarily charged parking space cannot be used as documentary evidence. The provision of at least 100% of the required bicycle parking will also be reflected positively in the evaluation. If the state´s building regulations do not require the provision of bicycle parking, the available local standards/regulations can be used. Depending on the local situation (e.g. level of bicycle usage) and on any specific problems, it may be beneficial or necessary to provide more or fewer bicycle racks than recommended by these guideline figures. The number of parking spaces required must be calculated by rounding up to the nearest whole number. A realistic projection must be calculated based on each project-specific case (representing the number of employees and site specifics).

- Public parking spaces 200 m from the main or side entrance: If there are public parking spaces within a reasonable distance of the building entrance that visitors, customers and other building users can use, this will be reflected positively in the evaluation.

Indicator 3: Market characteristics

The proportion of the space already sold or rented when the building project is completed shows whether the property is attractive to users when initially marketed. An analysis of the market risks should be conducted to check that the extent of the planned use of the building project is not based on excessively high expectations of the market. The method used to assess the market potential depends very heavily on the type of use. Buildings are assessed according to the market segment that applies to them (office market, retail outlets, residential market, etc.).
Since sources for market analyses are very often not generally accessible, an expert report that evaluates the necessary aspects is advantageous when it comes to the evaluation. Alternatively, a market analysis conducted by an estate agent/letting agent/property consultant along with a realistic appraisal can be used as documentary evidence.

Indicator 4: Degree of utilisation/units let at the time of completion

In addition to the initial marketing situation, the general commercial viability should be assessed. Where there is an owner-occupier, for example, or where the building has been tailored to the needs of the main tenant (anchor tenant), the initial rental aspect is fulfilled. However, this has no bearing on the fundamental market potential for subsequent rental once the original user has moved out. Where a building is 100% owner-occupied, the pre-rental is considered to be fully satisfied.

Indicator 4.2: Circular economy bonus – Circular economy users, tenants or hirers

If at least one company or party residing in the building actively contributes to a circular economy as users/owner-occupiers/tenants of the building, this can be positively reflected in the evaluation by means of a bonus. The company/party should implement its business model that contributes to a circular economy in the building itself, at the site or near the site (in the district) by means of joint material flow management or similar forms of collaboration with another company/party within the near vicinity of the building.

IV. Usage-specific description

Indicator 3: Market characteristics
Indicator 3.1: Market risks

Office

For office buildings, the market risks can be assessed by calculating the general rental performance (turnover) over the last few years in the relevant market segment in relation to the size of the building project. For office buildings as well, the size of the property can be analysed in relation to the existing office area in the market segment. If a relatively large, established office market already exists, it is highly likely that the new office space will also be taken on when it comes to subsequent rental.

Market data should be used to substantiate the commercial viability. However, the quality of statistics for the German office markets can be highly variable. There is no reliable, official data on existing office area, vacant buildings and turnover (rental income). This data is largely available for all cities, but for smaller towns, only some of this data is available. Since obtaining the data is labour-intensive (requires expert knowledge and skills, necessitates research, technical discussions and/or input from departments that must perform calculations), and an expert report (market value or loan value) is already drawn up for virtually all building projects in any case, the data in question can be substantiated with excerpts from this expert report. The proportion of office area newly created by the project in relation to the existing office area in the sub-market is a crucial factor for the appraisal in accordance with the evaluation of indicator 2.4 “Bicycle parking capacity allocated to the building”. This area quotient can be calculated using data on an existing office area from recognised market reports. An explanation is also then provided on which data can be obtained, to what extent and how. Since, for some sub-markets, only information on existing buildings is available, and for others, only information on rental performance in the market is available, either type of data can be used to assess this aspect. If both types of data are available, the turnover per unit of area (rental performance) is to be used.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1: Entrance situation, routing and signposting

- Photo documentation with explanation
- Excerpts from plans in conjunction with site plans

Indicator 2: Parking space situation

- Passenger car parking space entitlement documentation/bicycle parking entitlement documentation: Excerpts from plans in conjunction with site plans
- Excerpts from the building permit/documentation on the number of bicycle racks in accordance with the local standards/regulations
- Photo documentation with explanation
- Excerpt from the building permit documents (where a mandatory parking space charge has been requested)

Indicator 3: Market characteristics

- Presentation of the calculation of the area quotient and documentation of the input values for the calculation plus sources (expert statements or data from recognised market reports. If the above-mentioned documentation does not exist, an office market analysis conducted by an estate agent/letting agent/property consultant along with a reasonable appraisal can be used as documentary evidence instead).

Indicator 4: Degree of utilisation/units let at the time of completion

- Signed list by the building owner regarding the proportion of the space already rented at the time of completion, providing verifiable documentation of each of the users and the areas they occupy.
- Verification of joint material flow management or similar forms of collaboration between users/tenants and other companies occupying the building, contributing to a circular economy.

APPENDIX C – LITERATURE

I. Version

Change log based on 2018 version

PAGE	EXPLANATION	DATE
all	General and Evaluation: scheme “Assembly buildings” has been added	16.09.2021
305	Indicator 2.4: optional evaluation method added instead of national/local regulation	16.09.2021
305	Indicator 2.7: correction of the area unit from GFAs to UA 4	16.09.2021

II. Literature

- “Making Buildings Fit for Sustainable Mobility” report from the European Cyclists´ Federation (ECF): https://ecf.com/system/files/Bicycle%20vs%20Car%20Parking%20in%20Building%20Codes_ECF_ONLINE.pdf

Sociocultural and functional quality

The eight criteria of sociocultural and functional quality help to assess buildings with regard to **health**, **comfort** and **user satisfaction** as well as the essential aspects of **functionality**.

SOC1.1	Thermal comfort
SOC1.2	Indoor air quality
SOC1.3	Acoustic comfort
SOC1.4	Visual comfort
SOC1.5	User control
SOC1.6	Quality of indoor and outdoor spaces
SOC1.7	Safety and security
SOC2.1	Design for all

SOC1.1

Thermal comfort

Objective

Our objective is to guarantee thermal comfort that is appropriate for the intended use of the building throughout the year regardless of season, and to ensure user comfort.

Benefits

Measures that give building users the greatest possible control over indoor climate conditions improve their individual well-being. Improved well-being results in better satisfaction with the facilities and therefore also increases the productivity of building users.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)	CONTRIBUTION TO GERMAN SUSTAINABILITY STRATEGY
Low	3.4 Reduce mortality from non-communicable diseases and promote mental health	

Outlook

Thanks to digital solutions, technology is becoming ever more sophisticated and tailored more closely to individual needs. It is not necessary to specify concrete solutions to achieve points. Instead, designers are encouraged to concentrate more closely on addressing the objectives of the criterion in the context of their project. In order to ensure that desired parameters regarding thermal comfort of a building can continue to be achieved in future, it is recommended that designers familiarise themselves with future climate data predictions. This measure for climate adaptation and increased building resilience is currently addressed as a bonus, but will become increasingly important in these times of ongoing climate change. There are currently no plans to focus more heavily on this objective.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Assembly buildings**	**4.1%**	**4**
Education	**3.6%**	**4**
Residential **Logistics** **Production**	**4.3%**	**4**
Hotel	**3.9%**	**4**
Consumer market **Shopping centre** **Department stores**	**4.5%**	**4**

EVALUATION

Thermal comfort for the heating period and cooling period is evaluated depending on the intended use based on different aspects such as operative temperature, drafts, radiant temperature asymmetry and relative humidity. A total of 100 points can be achieved for this criterion or a maximum of 105 points including bonuses. In the area of **Education,** 120 points could be achieved. Nevertheless only a maximum of 100 points can actually be awarded.

NO.	INDICATOR		POINTS
1	**Operative temperature/indoor air temperature/heating period**		
1.1	**Operative temperature (heating period)**		
	(Area-weighted interpolation is possible)		
	Office **Education** **Residential** **Consumer market** **Hotel** **Assembly buildings**		**Max. 30**
	■ Compliance with requirements in compliance with the criteria in accordance with DIN EN 15251 Category III, see Appendix 2, or minimum national criteria – whichever is stricter – and supporting documentation. 5% deviation frequency of occupancy time is permitted		10
		Consumer market	15
	■ Compliance with requirements in compliance with the criteria in accordance with DIN EN 15251 Category II, see Appendix 2 5% deviation frequency of occupancy time is permitted*		20
		Consumer market	25
	■ Compliance with requirements in compliance with the criteria in accordance with DIN EN 15251 Category I, see Appendix 2 3% deviation frequency of occupancy time is permitted		30
	Hotel Note: Evaluation of this indicator can be carried out by means of different classification of office and hotel rooms into the categories mentioned above (max. 30 points).		
	Consumer market		
	■ Compliance with requirements in compliance with the criteria in accordance with DIN EN 15251 Category II, see Appendix 2 5% deviation frequency is permitted* In addition: Local heating system at checkout workstations (e.g. radiator, floor heating system)		30
	Logistics **Production**		**Max. 30**
	Portion of industrial work**		**Max. 30**
	■ Documentation of compliance with workplace regulation (ASR) A3.5 in workstation areas. see Appendix 2		15
	■ Implementation of additional measures for increasing thermal comfort with regard to the temperature across at least 95% of workstations, e.g. solutions enabling users to change the local temperature themselves, over-fulfilment of the values from Table 1 of workplace regulation A3.5 by at least 1 K		30

* The specified % figures of the acceptable deviation frequency refer to the sum of exceeding and underachieving frequencies (deviation time according to DIN EN 15251, Annex G). Regardless of the classification, the acceptable upper limit of category III can generally be used for the analysis of exceeding temperatures in the heating season. The rating can be done using area-weighted interpolation.

(+) Max.30

Portion of office spaces**

- Compliance with requirements in accordance with the workplace regulation and compliance with the criteria in accordance with DIN EN 15251 Category III, see Appendix 2 — 10
  5% deviation frequency of occupancy time is permitted
- Compliance with requirements in accordance with the workplace regulation and compliance with the criteria in accordance with DIN EN 15251 Category II, see Appendix 2 — 20
  5% deviation frequency of occupancy time is permitted
- Compliance with requirements in accordance with the workplace regulation and compliance with the criteria in accordance with DIN EN 15251 Category I, see Appendix 2 — 30
  3% deviation frequency of occupancy time is permitted

Not applicable for **Shopping centre** , **Department stores**

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2 Drafts/heating period

2.1 Drafts (heating period)

Office **Education** **Residential** **Hotel** **Consumer market** — **7,5**

Consumer market — **15**

- The air velocity at the workstations or in the open space does not rise above the maximum permitted value in accordance with Category B of DIN EN ISO 7730.
  For buildings without indoor air ventilation (HVAC) systems, this requirement is considered to have been complied with.

Shopping centre — **20**

- In all relevant drafts areas in malls (e.g. building entrances, air outlets, cold air downdrafts at façades), necessary measures are implemented to prevent drafts.

Logistics **Production** — **Max. 12**

Portion of industrial work** — Max. 12

- The air velocity at the workstations or in the open space does not rise above the maximum permitted value in accordance with Category B of DIN EN ISO 7730. For buildings without indoor air ventilation (HVAC) systems, this requirement is considered to have been complied with. — 8
- In addition, a concept for evaluating the risk of drafts due to open doors must be created. The structural, technical or organisational measures required based on the concept, such as air curtain systems, double door systems, automated door systems, high-speed doors, etc., are implemented. — +4

Portion of office spaces** — **(+) 12**

- The air velocity at the workstations or in the open space does not rise above the maximum permitted value in accordance with Category B of DIN EN ISO 7730. For buildings without indoor air ventilation (HVAC) systems, this requirement is considered to have been complied with.

Assembly buildings **7.5**

- Intermediate level for buildings, such as exhibition halls, where the large number of functional gates is required: 3
  In all areas, in which drafts can impair comfort, the certain measures have been implemented to avoid drafts (e.g. at building entrances, air outlets, air inlet openings for natural ventilation).
- The air speed at the workplaces or in the occupied area does not rise above the maximum permissible value according to Category B of the DIN EN ISO 7730. For buildings without air conditioning systems, the requirement is considered to be fulfilled. 7.5

Not applicable for **Department stores**

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3 Radiant temperature asymmetry and floor temperature/heating period

3.1 Radiant temperature asymmetry and floor temperature (heating period)

Office **Education** **Residential** **Hotel** **Assembly buildings** **7.5**

Logistics **Production** **2**

- The interior surface temperatures largely comply with the following limit values:

Ceiling maximum	35 °C
Glass surfaces of the façade/wall minimum	18 °C
Glass surfaces of the façade/wall maximum	35 °C
Floor maximum	29 °C

Additionally for **Logistics** **Production** **+ 4,5**

- Documentation of sufficient structural/technical measures for preventing radiant temperature asymmetry

Note: for certain types of the scheme **Assembly buildings** this indicator is **variable**
(for more detailed information refer to the chapter: “IV. Usage-specific description”)

Not applicable for **Shopping centre** **Department stores** **Consumer market**

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4 Relative humidity/heating period (quantitative)

4.1 Relative humidity (heating period)

Office **Education** **Residential** **Logistics** **Production** **Consumer market** **5**
Assembly buildings

Shopping centre **10**

- The indoor air does not become too dry during the heating period (even in the event of low exterior temperatures or dry exterior air), i.e. the indoor humidity meets the following requirement:

$$\varphi \geq 25\%$$

This requirement is met over at least 95% of the operating hours.

Hotel **5**

- The indoor air does not become too dry during the heating period (even in the event of low exterior temperatures or dry exterior air), i.e. the indoor humidity meets the following requirement:

$$75\% \geq \varphi \geq 25\%$$

This requirement is met over at least 95% of the operating hours.

Not applicable for **Department stores**

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5 Operative temperature/indoor air temperature/cooling period

5.1 Operative temperature (cooling period)

(Area-weighted interpolation is possible)

Office **Education** **Residential** **Hotel** **Assembly buildings** **Max. 35**

Consumer market **Max. 30**

- Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter, see Appendix 3 — 10
- compliance with the criteria in accordance with DIN EN 15251 Category III, see Appendix 3.5% deviation frequency of occupancy time is permitted — 20
- Compliance with the criteria in accordance with DIN 4108-2 and compliance with the criteria in accordance with DIN EN 15251 Category II, see Appendix 3, 5% deviation frequency of occupancy time is permitted — 30
- Compliance with the criteria in accordance with DIN EN 15251 Category I, see Appendix 3, 3% deviation frequency of occupancy time is permitted. — 35

(not applicable for **Consumer market**)

Education **20**

- Kindergarten: Shaded exterior areas are always accessible.

Class: Compliance with the criteria in accordance with DIN EN 15251 Category III, see Appendix 3
5% deviation frequency is permitted*

Hotel Note: Evaluation of this indicator can be carried out by means of different classification of office and hotel rooms into the categories mentioned above (max. 35 points).

Shopping centre **Max. 40**

Please note: Evaluation of this indicator can be carried out by means of different classification of the mall/shopping street and the rental spaces (max. 40 points)

Temperature/cooling period of mall/shopping street **Max. 15**

- Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter, see Appendix 3 — 6
- Compliance with the criteria in accordance with DIN EN 15251 Category III, upper temperature limit — 9

  $qi = 0.33\ \theta_{rm} + 18.8\ °C + 4\ K$

  5% frequency of exceeding is permitted
- Compliance with the criteria in accordance with DIN EN 15251 Category II, upper temperature limit — 12

  $qi = 0.33\ \theta_{rm} + 18.8\ °C + 3\ K$

  5% frequency of exceeding is permitted
- Compliance with the criteria in accordance with DIN EN 15251 Category I, upper temperature limit — 15

qi = 0.33 θ_{rm} + 18.8 °C + 2 K

3% frequency of exceeding is permitted

* The specified % figures of the permissible deviation frequency refer to the sum of exceeding and underachieving frequencies (deviation time according to DIN EN 15251, Annex G). Regardless of the classification, the permissible upper limit of category III can generally be used for the analysis of exceeding temperatures in the heating period. The rating can be interpolated area-weighted.

** The thermal comfort requirements for office and industrial work to be evaluated according to evaluation guide (see method)

Temperature/cooling period/rental space	**+ Max. 25**
■ Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter, see Appendix 3	10
■ 40 W/m²	15
■ 60 W/m²	20
■ 80 W/m²	25
Alternative documentation	
■ Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter, see Appendix 3	10
■ Compliance with the criteria in accordance with DIN EN 15251 Category III, see Appendix 3	15
5% deviation frequency is permitted	
■ Compliance with the criteria in accordance with DIN EN 15251 Category II, see Appendix 3	20
5% deviation frequency is permitted	
■ Compliance with the criteria in accordance with DIN EN 15251 Category I, see Appendix 3	25
3% deviation frequency is permitted	

Department stores	**Max. 100**
■ Compliance with the criteria in accordance with DIN 4108-2, see Appendix 3	10
■ 40 W/m²	25
■ 60 W/m²	75
■ 80 W/m²	100
Alternative documentation	
■ Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter, see Appendix 3	10
■ Compliance with the criteria in accordance with DIN EN 15251 Category III, see Appendix 3	25
5% deviation frequency is permitted	
■ Compliance with the criteria in accordance with DIN EN 15251 Category II, see Appendix 3	75
5% deviation frequency is permitted	
■ Compliance with the criteria in accordance with DIN EN 15251 Category I, see Appendix 3	100
3% deviation frequency is permitted	

Logistics **Production**	**Max. 30**
Portion of industrial work**	**Max. 30**
■ Compliance with workplace regulation A3.5 see Appendix 3.	10

- If the air temperature in the workstation area exceeds 26 °C, structural and technical measures are implemented — 15
- Limiting the air temperature in the workstation area to a maximum of 30 °C — 20
- Limiting the air temperature in the workstation area to a maximum of 26 °C. — 30

Portion of office spaces** — **(+) Max. 30**

- Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter, see Appendix 3 — 10
- Compliance with DIN 4108-2 and compliance with the criteria in accordance with DIN EN 15251 Category III, see Appendix 3 (5% deviation frequency is permitted) — **15**
- Compliance with DIN 4108-2 and compliance with the criteria in accordance with DIN EN 15251 Category II, see Appendix 3 (5% deviation frequency is permitted) — **20**
- Compliance with DIN 4108-2 and compliance with the criteria in accordance with DIN EN 15251 Category I, see Appendix 3 (3% deviation frequency is permitted) — 30

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6 Drafts/cooling period

6.1 Drafts (cooling period)

Office **Education** **Residential** **Hotel** **Logistics** **Production** **Assembly buildings** — **5**

Consumer market — **15**

- Compliance with Cat. B in accordance with DIN EN ISO 7730, Annex A, Figure A2. For buildings without indoor air ventilation (HVAC) systems, this requirement is considered to have been complied with.

Shopping centre

- In all relevant drafts areas in malls (e.g. building entrances, air outlets, air vent openings for natural ventilation), necessary measures are implemented to prevent drafts. — **20**

Not applicable for **Department stores**

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7 Radiant temperature asymmetry and floor temperature/cooling period

7.1 Radiant temperature asymmetry and floor temperature (cooling period)

Office **Education** **Residential** **Hotel** **Assembly buildings** — **5**

Logistics **Production** — **2**

The interior surface temperatures largely comply with the following limit values:

- Ceiling minimum — 16 °C
- Ceiling maximum — 35 °C
- Glass surfaces of the façade/wall minimum — 18 °C
- Glass surfaces of the façade/wall maximum — 35 °C
- Floor minimum — 19 °C
- Floor maximum — 29 °C

Additionally for **Logistics** **Production** 4,5

- Documentation of sufficient structural/technical measures for preventing radiant temperature asymmetry.

Not applicable for **Shopping centre** **Department stores** **Consumer market**

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8 Indoor humidity/cooling period

8.1 Indoor humidity (cooling period)

Office **Education** **Residential** **Hotel** **Logistics** **Production** **Consumer market** **Assembly buildings** **5**

Shopping centre **10**

The indoor air does not become too humid during the cooling period (even in the event of high exterior temperatures), i.e. the indoor humidity meets the following requirements:

- Absolute humidity < 12 g/kg

The requirements for indoor humidity must be complied with, regardless of whether the interior spaces are ventilated through windows or a ventilation system.

Not applicable for **Department stores**

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9 AGENDA 2030 BONUS – CLIMATE ADAPTATION

Resilient thermal comfort: The frequency of exceeding during the heating and cooling period is determined for buildings using climate data predictions for 2030 and 2050. The results are used in the decision-making process at the planning stage.

+5

** The thermal comfort requirements for office and industrial work to be evaluated according to evaluation guide(see method)

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPIs) include communicating the values for operative temperature, air velocities, surfaces and indoor humidity. Basic data and the results of a thermal simulation can be used for reporting purposes in accordance with the "Level(s) – Common EU framework of core environmental indicators".

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Frequency of deviation of the operative temperature (heating and cooling period), corresponds to Level(s) indicator 4.2: Time out of range	[%]
KPI 2	Number or proportion of workstations where the specified frequency of deviation of the operative temperature (heating and cooling period) is applicable	[%]
KPI 3	Upper and lower temperature limits for the operative temperature (heating and cooling period), corresponds to Level(s) indicator 4.2: Performance Assessment results	[°C]
KPI 4	Maximum air velocities at the workstations (heating and cooling period)	[%]
KPI 5	Number of workstations where the specified air velocities is applicable	[%]
KPI 6	Maximum and minimum interior surface temperatures	[°C]
KPI 7	Indoor humidity (maximum and minimum) corresponds to elements of Level(s) indicator 4.1.1 for 95% of the operating time	[%]
KPI 8	Climate zone, and heating and cooling days also correspond to Level(s) basic data regarding the building	[zone] [number]
KPI 9	Number of exceeding temperature hours in 2030 and 2050 corresponds to Level(s) indicator 5.1: Time outside of thermal comfort range – Time out of range 2030/2050	[kh/a]

Synergies with DGNB System applications

- **DGNB OPERATION:** Achieving a high level of thermal comfort for buildings in use (BIU) is indirectly assessed positively for the evaluation of the user satisfaction in criterion SOC9.1.
- **DGNB RENOVATED BUILDINGS:** Large similarities with criterion SOC1.1 in the REN scheme.
- **DGNB INTERIORS:** Criterion PRO1.1 establishes an incentive for taking sustainability aspects of thermal comfort into account when choosing rental spaces.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Thermal comfort in buildings significantly contributes to ensuring an efficient and productive working and living environment, and to achieving high levels of user satisfaction.

A room is thermally comfortable if it is neither too cold nor too warm, the air is neither too dry nor too humid and that no draft is present.

II. Additional explanation

The acceptability of the indoor climate depends on the indoor air temperature, the temperature of the surfaces surrounding the user, the air velocity in the room and the relative humidity, throughout both the cooling period and the heating period. This should take into account not only the overall level of comfort, but also the possibility of local phenomena occurring that could negatively impact thermal comfort. This means that a person could be overall thermally comfortable, but still experience discomfort on a part of their body due to local drafts.

III. Method

Thermal comfort in the heating and cooling period is evaluated via several individual indicators. The specifications of DIN EN 15251, DIN EN ISO 7730, DIN EN ISO 13786, DIN EN ISO 10211, together with the DIN EN ISO 13370, (or) DIN EN ISO 13789, DIN EN 12831 and the workplace regulation (from German Employers' Liability Insurance Association) form the basis of the evaluation.

The following indicators are assessed as part of the evaluation:

(1) Operative temperature/indoor air temperature/heating period (quantitative)
(2) Drafts/heating period (qualitative)
(3) Radiant temperature asymmetry and floor temperature/heating period (qualitative)
(4) Relative humidity/heating period (quantitative)
(5) Operative temperature/indoor air temperature/cooling period (quantitative)
(6) Drafts/cooling period (qualitative)
(7) Radiant temperature asymmetry and floor temperature/cooling period (qualitative)
(8) Relative humidity/cooling period (quantitative)
(9) Agenda 2030 bonus: Thermal comfort climate adaptation

The vertical temperature gradient is an indicator that cannot yet be assessed and is therefore left out of the evaluation.

For the analysis of the operative temperature in the cooling period, it is important to differentiate between rooms with cooling and rooms without cooling.

The following criteria are used to determine whether the building in question is without cooling and therefore whether the adaptive comfort model from DIN EN 15251 should be applied:

- The rooms must have windows or openings that allow exterior air to enter and that can be easily opened and adjusted by users.
- There must not be any mechanical cooling used in the room. Radiant cooling or surface cooling (e.g. cooling ceilings or concrete core cooling/component activation) must be categorised as mechanical cooling for the purposes of this criterion.
- Mechanical ventilation with uncooled air (in the cooling period) may be used, but priority must be given to being able to open and close windows as a means of regulating the indoor climate.
- In addition, other low-energy options for personal regulation of the interior temperature may be used, such as shutters, night time ventilation, etc.
- Appendix 2: Permissible upper and lower temperature limits of the comfort categories in the heating period
- Appendix 3: Permissible upper and lower temperature limits of the comfort categories in the cooling period

Room or area reference
Indicators 1 and 5:
Verification of indicators 1 and 5 "Operative temperature" must be carried out via area-weighted averaging.

It is generally not necessary to simulate the entire building. A representative sample of rooms must instead be analysed (clustering). The representative rooms must be selected so that 95% of the areas described in Appendix 1 correspond to the evaluated quality level. In order to ensure that the results can be applied to the other rooms, the usage zones must be arranged in such a way that different boundary conditions (e.g. specific internal and external loads) and building technology concepts are taken into account. Critical rooms such as corner rooms, rooms with large glass surfaces, etc. must be included in the documentation. In general, it can be assumed that a functioning room concept for a critical room can also ensure thermal comfort for non-critical rooms with otherwise identical conditioning.

Indicators 2, 3, 4, 6, 7, 8:
The other indicators for thermal comfort have a low importance in comparison to indicators 1 and 5, meaning that these indicators are only considered as examples for representative rooms for each scheme. The room under consideration is listed in **bold** in Appendix 1.
The representative room must be selected so that 80% of the usable area under consideration corresponds to the evaluated quality level.

Indicator 9: Agenda 2030 bonus: Thermal comfort climate adaptation
The frequency of exceeding during the heating and cooling period is determined for buildings using climate data predictions for 2030 and 2050. The results are used in the decision-making process at the planning stage. The climate data used should be based on the UN IPCC "Mitigation" (SRES E1) emissions scenario. The "Medium-high" (SRES A1B) emissions scenario can be used as a second "worst-case scenario". Information regarding the assessment methodology and the possible areas of focus in the planning process can be found in the "Level(s) framework" published by the European Commission (Source: "Level(s) – A common EU framework of core sustainability indicators for office and residential buildings", Draft Beta v1.0, Brussels, August 2017).

IV. Usage-specific description

For indicators 1 and 5, all listed rooms are analysed. For the remaining indicators, the rooms that are to be analysed can be found in Appendix 1 (rooms listed in bold).

Office

The room and area reference is shown in Appendix 1: Rooms to be verified, for usage group 2 – Office work.

Education

The room and area reference is shown in Appendix 1: Rooms to be verified, for usage group 5 – Education, teaching and culture.

Indicators 1 and 5: Operative temperature

For the day nurseries building use in the New Education Facilities (NEF) scheme, the required operative room temperature is different than other education-specific building uses.

Residential

The room and area reference is shown in Appendix 1: Rooms to be verified, for usage group 1 – Residential and recreation.

Hotel

The room and area reference is shown in Appendix 1: Rooms to be verified, for usage groups 1 – Residential and recreation and 2 – Office work.

Shopping centre

Contrary to Appendix 1, the following rooms or areas are analysed for evaluation in the scheme NSC15 Shopping centres:

For the following indicators, only the areas within the mall or shopping street are analysed:
2. Drafts/heating period
6. Drafts/cooling period
8. Relative humidity/cooling period
4. Relative humidity/heating period
In indicator 5: Operative temperature/indoor air temperature/cooling period
Indicator 5.1: Mall or shopping street
Indicator 5.2: Tenant areas

The following indicators are not included in this scheme:
1. Operative temperature/indoor air temperature/heating period
3. Radiant temperature asymmetry and floor temperature/heating period
7. Radiant temperature asymmetry and floor temperature/cooling period

Department stores

The room and area reference is shown in Appendix 1: Rooms to be verified, for usage group 4 – Distribution and sales.
Contrary to Appendix 1, only the sales areas are analysed in the scheme Department stores.

The following indicators are not included in this scheme:
1. Operative temperature/indoor air temperature/heating period
2. Drafts/heating period
3. Radiant temperature asymmetry and floor temperature/heating period
4. Relative humidity/heating period
6. Drafts/cooling period
7. Radiant temperature asymmetry and floor temperature/cooling period
8. Relative humidity/cooling period

Logistics **Production**

Evaluation guide:
The requirements for thermal comfort vary for office and industrial work.
For offices with a usable area of ≥ 400 m² or ≥ 20 permanent workstations, the thermal comfort for both office and industrial areas must be analysed.

- Case I: Number of office workstations ≥ 15% of the total workstations or ≥ 20 permanent office workstations:

Evaluation by proportion of office area and proportion of industrial area

The room and area reference for usable office area are shown in Appendix 1: Rooms to be verified, for usage groups 2 – Office work and 3 – Production, manual and machine work.

For the evaluation, the proportion of office area and the proportion of industrial area must be analysed in the individual indicators.

$$\text{Total points} = \text{points for proportion of office area} \times \frac{\text{number of office workstations}}{\text{total number of workstations}} +$$

$$\text{points for proportion of industrial work} \times \frac{\text{number of industrial workstations}}{\text{total number of workstations}}$$

- Case II: Number of office workstations < 15% of the total workstations and < 20 permanent office workstations: Evaluation by proportion of industrial area

For the evaluation, the proportion of industrial area must be analysed in the individual indicators.
Total points = points for proportion of industrial work

An evaluation tool has been created to simplify the documentation process.

Indicators 1 and 5:
The following points must be noted for verification of compliance with workplace regulation A3.5:
It is necessary to check whether there are operational requirements at the workstations that could lead to loss of comfort. These include issues regarding air temperature, air humidity, air velocity, thermal radiant, work intensity or clothing. If this is the case, the risk assessment process must involve checking which technical, organisational or personal measures, if any, are necessary, and whether work is to be carried out in hot environments.

Heating period
In addition, the workstations must be categorised based on work intensity in accordance with Table 2 of workplace regulation A3.5. Room heating must be designed such that the minimum values for indoor air temperature, in

accordance with Table 1 of workplace regulation A3.5, are complied with. Local temperature differences and temperature stratification must be taken into account in a suitable form as part of this.

If it is not possible to reach the minimum values in accordance with Table 1 of workplace regulation A3.5 in workspaces, even after exhausting all technical options, additional measures from the following categories, in this order of priority, must be implemented to prevent temperatures from falling too low:

- Technical measures relating to workstations (e.g. thermal radiant heaters, heating mats)
- Organisational measures (e.g. heating periods)
- Personal measures (e.g. suitable clothing).

Documentation that the measures specified above are sufficient can be compiled, for example, using a PMV evaluation in accordance with DIN EN ISO 7730.

Cooling period
In particular cases, working at temperatures above +26 °C can lead to health risks, if, for example:

- Work involves heavy physical labour,
- Special protective clothing must be worn that significantly reduces heat dissipation.

In such cases, additional measures must be chosen for implementation via a risk assessment tailored to the specific circumstances.

Definition
Automated door systems are motorised doors with manual (e.g. radio, pull-cord or push-button) or automatic (e.g. induction loop, radar, laser, light barrier) initiating mechanisms.

High-speed doors are doors with an average opening and closing speed above 0.5 m/s. Suitable organisational measures may include preventing opposite doors opening.

Assembly buildings
The spatial and area reference can be found in Appendix 1: Rooms for use group 2 - office work, 3 - production, manual and machine work, experiment, 4 - storage, distribution, selling, 5 - education, teaching and culture as well as additional information on other areas, such as corridors, foyer areas etc. are to be considered if they are approved to assign the scheme “Assembly Buildings”.

For the assessment of the buildings, which do not operate all year round, the adoption of the usage and operating times e.g. according to the scheme specific EPC / energy simulation / calculation is desirable. In the case of trade fairs, for example, only the event times (when the exhibition is open) are relevant to the assessment and not the time when the hall is closed (the space is vacant), during when the temperature may be reduced.

2. Drafts / heating period
In some building types such as trade fairs, for the proper operation a large number of functional doors are necessary, thus, certain measures to avoid the drafts will be evaluated positively. For all other “Assembly building” types, compliance with the DIN EN ISO 7730 category B, (Appendix A, Figure A2) is a necessary requirement.

3. Radiation temperature asymmetry and floor temperature / heating period (variable). In buildings, such as trade fairs, the indicator 3.1 (variable) can be set to "not relevant" if no areas for permanent residence is in the direct vicinity of ceiling-high glazed elements, or ceilings and/or floors are not used as a source for cooling or heating.

APPENDIX B – DOCUMENTATION

I. Required documentation

Office **Education** **Residential** **Hotel** **Consumer market** **Shopping centre** **Logistics** **Production** **Assembly buildings**

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements Some forms of documentation apply to all schemes. Depending on the scheme, different documentation may also be relevant – in such cases, the relevant documentation will be explicitly stated.

In accordance with Appendix 4: "Permitted documentation processes"

Indicator 1: Operative temperature/indoor air temperature/heating period

Office **Education** **Residential** **Hotel** **Consumer market** **Logistics** **Production** **Assembly buildings**

Basis and results of the completed thermal building simulation
Measurement report for the completed measurements for documenting the thermal comfort
Calculation of the heating load in accordance with DIN EN 12831 or local standard

Indicator 2: Drafts/heating period

Office **Education** **Residential** **Hotel** **Consumer market** **Logistics** **Production** **Assembly buildings**

Characteristics of the air outlets, e.g. in the form of manufacturer data sheets
Basis and results of the completed flow simulations
Measurement reports

Shopping centre **Logistics** **Production buildings** **Assembly buildings**

Representation and documentation of the relevant drafts areas in the mall/shopping street areas
Representation and documentation of the implementation of the required measures to prevent the possibility of drafts

Indicator 3: Radiant temperature asymmetry and floor temperature/heating period

Office **Education** **Residential** **Hotel** **Logistics** **Production** **Assembly buildings** [1]

The permitted documentation process depends on the type of component:

Heated components:
Verification is carried out via documentation of the design.
Non-heated, opaque components:
If the U-values in accordance with criterion TEC1.3 are complied with, it is assumed that the criteria for minimum temperatures are also met.
Non-heated, transparent components:
Zonal thermal simulation
One-dimensional heat flow calculation
Simplified table method

Indicator 4: Indoor humidity/heating period

Office **Education** **Residential** **Logistics** **Production** **Consumer market** **Assembly buildings** **Shopping centre** **Hotel**

[1] Variable Indicator

The permitted verification processes depend on whether the room is equipped with a ventilation system with humidification function:

Mechanical ventilation system with humidification and dehumidification function:

–Verification is carried out via documentation of the design of ventilation system

Rooms without humidification via the mechanical ventilation system, without humidification and dehumidification function, or without window ventilation:

–The requirement is considered to have been met if the indoor humidity can be changed via a device/system.

Zonal moisture simulation or expansion of the thermal simulation to include moisture balances that represent the chronological progression of air humidity in the room

Indicator 5: Operative temperature/indoor air temperature/cooling period

Basis and results of the completed thermal building simulation

Measurement report for the completed measurements for documenting the thermal comfort

Cooling load calculations in accordance with EN 16798-11 (Module 3 and 4 from ISO 52000-1) or local standard

Indicator 6: Drafts/cooling period

Characteristics of the air outlets, e.g. in the form of manufacturer data sheets

Basis and results of the completed flow simulations

Office **Education** **Residential** **Hotel** **Logistics** **Production** **Assembly buildings**

Measurement reports

Intermediate level **Assembly buildings**

Presentation of the measures to avoid drafts

Indicator 7: Radiant temperature asymmetry and floor temperature/cooling period

Office **Education** **Residential** **Hotel** **Logistics** **Production** **Assembly buildings**

Documentation of the design of the cooled components

Office **Education** **Hotel** **Consumer market**

Representation of the overall concept for the façade/solar radiation protection/cooling system

Zonal room simulations

CFD flow simulations or spectral calculations

Indicator 8: Indoor humidity/cooling period

The permitted verification processes depend on whether the room is equipped with a ventilation system with a humidification function:

Mechanical ventilation system with humidification and dehumidification function:

–Verification is carried out via documentation of the design of the ventilation system

Rooms without humidification via the mechanical ventilation system, without humidification and dehumidification function, or without window ventilation:

–Expansion of the thermal simulation to include moisture balances that represent the chronological progression of air humidity in the room

Office **Education** **Residential** **Hotel** **Logistics** **Production** **Shopping centre** **Assembly buildings**

Zonal moisture simulation

The permitted verification processes depend on whether the room is equipped with a ventilation system with a humidification function:

Mechanical ventilation system with humidification and dehumidification function:
Verification is carried out via documentation of the design of the ventilation system
Rooms without humidification via the mechanical ventilation system, without humidification and dehumidification function, or without window ventilation:
Zonal moisture simulation or expansion of the thermal simulation to include moisture balances that represent the chronological progression of air humidity in the room Zonal moisture simulation

Indicator 9: Agenda 2030 bonus: Thermal comfort climate adaptation

- Results of the thermal simulation/calculation which are done using the climate data predictions for 2030 and 2050

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
all	Genral, Evaluation and Usage-specific description: scheme “Assembly buildings” has been added	16.09.2021
	Appendix 1: areas for the scheme “Assembly buildings” have been added	16.09.2021
	Indicator 9: Agenda 2030 bonus: type-error correction, instead of A!B is now A1B	16.09.2021

II. Literature

- DIN 277-1:2016-01: Areas and volumes of buildings – Part 1: Building construction, Berlin, January 2016
- DIN 33403-02. Climate at the workplace and in its environments – Part 2: Effect of the climate on the heat balance of human beings. Berlin: Beuth Verlag. August 2000
- DIN EN 4108-2. Thermal protection and energy economy in buildings – Part 2: Minimum requirements to thermal insulation. Berlin: Beuth Verlag. February 2013
- DIN EN 12831. Heating systems in buildings – Method for calculation of the design heat load. Berlin: Beuth Verlag. August 2003
- DIN EN 13363. Solar protection devices combined with glazing – Calculation of total solar energy transmittance and light transmittance – Part 2: Detailed calculation method. Berlin: Beuth Verlag. June 2005
- DIN EN 15251. Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics. Berlin: Beuth Verlag. December 2012
- DIN EN ISO 7726. Ergonomics of the thermal environment – Instruments for measuring physical quantities. Berlin: Beuth Verlag. April 2002
- DIN EN ISO 7730. Ergonomics of the thermal environment – Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria. Berlin: Beuth Verlag. May 2006
- ISO 15099. Thermal performance of windows, doors and shading devices – detailed calculations. Berlin: Beuth Verlag. March 2011
- VDI guideline VDI 2078. Calculation of cooling load and room temperatures of rooms and buildings (VDI Cooling Load Code of Practice). Düsseldorf: Verein Deutscher Ingenieure e.V. June 2015
- VDI guideline VDI 3804. Air-conditioning – Office buildings (VDI ventilation code of practice). Düsseldorf: Verein Deutscher Ingenieure e.V. March 2009
- VDI guideline VDI 6020: Requirements on methods of calculation to thermal and energy simulation of buildings and plants. Verein Deutscher Ingenieure e.V.
- Workplace regulation A3.5 Raumtemperatur [Room temperature]. German Federal Institute for Occupational Safety and Health (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin). June 2010

APPENDIX 1

Rooms to be verified

ROOMS TO BE VERIFIED

PLEASE NOTE: DIFFERENT USES WITHIN A BUILDING MUST BE REPRESENTED THROUGH AREA-WEIGHTAGE IN ACCORDANCE WITH THE AREAS DESCRIBED BELOW. A REPRESENTATIVE SAMPLE OF ROOMS MUST BE ANALYSED (CLUSTERING). THE REPRESENTATIVE ROOMS MUST BE SELECTED SO THAT 95% OF THE AREAS CORRESPOND TO THE EVALUATED QUALITY LEVEL.

SCHEME	TYPE OF USABLE AREA (UA) IN ACCORDANCE WITH DIN 277-1 BEING VERIFIED (Area definitions under the doc. Evaluation and structure of the DGNB system, chapter 4 "T&D")	
	TABLE 1: NO. – USE GROUP	TABLE 2: NO. – AREAS AND VOLUMES
Office	2 – Office work (UA 2)	**Office rooms** **Open-plan offices** Meeting rooms (these are also considered to include conference rooms) Design rooms Ticket office Control rooms Surveillance rooms
Consumer markets **Shopping centre**	2 – Office work (UA 2)	**Office rooms** **Open-plan offices** Meeting rooms Design rooms Ticket office Control rooms Surveillance rooms
Department stores	4 – Distribution and sales (excl. storage) (UA 3 and 4)	Reception and distribution areas (where these are permanent working areas) **Sales rooms** Showrooms Workshops (where these are permanent working areas)

	2 – Office work (portion of administrative work) (UA 2)	**Office rooms** **Open-plan offices** Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms
Logistics buildings **Production buildings**	3 – Production, manual and machine work, experiment (portion of industrial work) (UA 3)	**Factory halls** **(where these are permanent working areas)** **Workshops** **(where these are permanent working areas)** Technological laboratories Physics, engineering physics and electrical engineering laboratories Chemistry, bacteriology and morphology laboratories
	4 – Storage, distribution, sales(only the designated work zones) (UA 4)	Warehouses Archives, collection rooms **Reception and distribution areas (these are also considered to include order picking areas)**
Residential	1 – Residential and recreation (UA 1)	**Living spaces** Common rooms Break rooms Waiting rooms Dining rooms
Hotel	1 – Residential and recreation (portion of hotel rooms) (UA 1)	**Living spaces** Common rooms Break rooms Waiting rooms Dining rooms
	2 – Office work (portion of offices) (UA 2)	**Office rooms**
Education	5 – Education, teaching and culture (UA 5)	**Classrooms with fixed seating** **General classrooms and practice rooms without fixed seating** Dedicated classrooms and practice rooms without fixed seating Library rooms Assembly rooms or areas Stages, studios Exhibition rooms

	2 – office work (UA 2)	**Office rooms** **Open-plan offices** Meeting rooms (these are also considered to include conference rooms) Design rooms Ticket office Control rooms Surveillance rooms Office equipment rooms
	3 – Production, manual and machine work, experiment (only the designated work areas) (UA 3)	**Factory halls** **(where these are permanent working areas)** **Workshops** **(where these are permanent working areas)** Technological laboratories Physics, engineering physics and electrical engineering laboratories Rooms for keeping animals rooms for plant cultivation Commercial kitchens (including dispensing and returning) Special workrooms (for housekeeping, laundry care, etc.)
Assembly buildings	4 – Storage, distribution, sales, in particular (only the designated work zones) (UA 4)	Warehouses Archives, collection rooms **Reception and distribution areas (these are also considered to include order picking areas, sales rooms, exhibition rooms)**
	5 – Education, teaching and culture (UA 5)	**Classrooms with fixed seating** **General classrooms and practice rooms without fixed seating** Dedicated classrooms and practice rooms without fixed seating Library rooms Assembly rooms or areas Stages, studios Exhibition rooms
	Remarks regarding variable area usage: ▪ Floor areas with variable usage (e.g. entrance halls to the traffic area despite simultaneous use for information, breaks, exhibitions, etc.) are to be allocated to the above-mentioned areas according to the predominant use. ▪ Circulation areas within rooms (e.g. between the furnishings in open-plan offices or between machines in factory halls or visitor aisles in exhibitions) do not belong to the circulation area (CS), but to the usable area (UA).	

APPENDIX 2

Permitted lower temperature limits during the heating period (in accordance with DIN EN 15251 and DIN EN ISO 7730)

	LEVEL OF ACTIVITY	CATEGORY IN ACCORDANCE WITH DIN EN 15251	PMV INDEX/OPERATIVE TEMPERATURE FOR HEATING PERIOD LOWER LIMIT CLOTHING ≈ 1.0 CLO	PMV INDEX/OPERATIVE TEMPERATURE FOR HEATING PERIOD UPPER LIMIT CLOTHING ≈ 1.0 CLO
Office work	Sitting ~ 1.2 met	Category I	-0.2 / +21.0 °C	
		Category II	-0.5 / +20.0 °C	
		Category III	-0.7 / +19.0 °C	+0.7 / +25.0 °C
Distribution and sales – I	Standing, walking ~ 1.6 met	Category I	-0.2 / +17.5 °C	
		Category II	-0.5 / +16.0 °C	
		Category III	-0.7 / +15.0 °C	+0.7 / +23.0 °C
Distribution and sales – II	Working ~ 2.0 met	Category I	-0.2 / +14.0 °C*	
		Category II	-0.5 / +12.0 °C*	
		Category III	-0.7 / +11.0 °C*	+0.7 / +21.0 °C*
Production, manual and machine work, experiment – I	Working ~ 1.6 met	Category I	-0.2 / +17.5 °C	
		Category II	-0.5 / +16.0 °C	
		Category III	-0.7 / +15.0 °C	+0.7 / +23.0 °C
Production, manual and machine work, experiment – II	Working ~ 2.0 met	Category I	-0.2 / +14.0 °C*	
		Category II	-0.5 / +12.0 °C*	
		Category III	-0.7 / +11.0 °C*	+0.7 / +21.0 °C*

Residential and recreation	Sitting ~ 1.2 met	Category I	-0.2 / +21.0 °C	
		Category II	-0.5 / +20.0 °C	
		Category III	-0.7 / +18.0 °C	+0.7 / +25.0 °C
Education, teaching and culture	Sitting ~ 1.2 met	Category I	-0.2 / +21.0 °C	
		Category II	-0.5 / +20.0 °C	
		Category III	-0.7 / +19.0 °C	+0.7 / +25.0 °C
Kindergarten	Standing, walking ~ 1.4 met	Category I	-0.2 / +19.0 °C	
		Category II	-0.5 / +17.5 °C	
		Category III	-0.7 / +16.5 °C	+0.7 / +23.5 °C

* Values determined in accordance with DIN EN ISO 7730

For analysis of temperatures exceeding limit values during the heating period, the permitted upper limit from **Category III** can generally be used regardless of the classification.

If the levels of activity or the clothing factors do not correspond to those in the actual use conditions, the PMV can also be verified as an alternative to the operative temperature. The selected boundary conditions must be verified. The clothing factor must be applied consistently for the heating period.

Permitted minimum values for the indoor air temperature in work areas in accordance with workplace regulation A3.5

PRIMARY POSTURE	WORK INTENSITY: LIGHT	WORK INTENSITY: MEDIUM	WORK INTENSITY: HEAVY
Sitting	+ 20 °C	+ 19 °C	-
Standing, walking	+ 19 °C	+ 17 °C	+ 12 °C

WORK INTENSITY	EXAMPLES
Light	Light manual/arm work while sitting or standing still, combined with occasional walking
Medium	Medium-intensity manual/arm or leg work while sitting, walking or standing
Heavy	Heavy manual/arm or leg work while sitting, walking or standing

APPENDIX 3

Permitted upper temperature limits during the cooling period (in accordance with DIN EN 15251 and DIN EN ISO 7730)

	LEVEL OF ACTIVITY	CATEGORY IN ACCORDANCE WITH DIN EN 15251	PMV INDEX/OPERATIVE TEMPERATURE FOR BUILDINGS WITH MECHANICAL COOLING CLOTHING ≈ 0.5 CLO		PMV INDEX/OPERATIVE TEMPERATURE FOR BUILDINGS WITH NO COOLING: ADAPTIVE COMFORT MODEL CLOTHING ≈ 0.5 CLO	
			LOWER LIMIT FOR COOLING PERIOD	UPPER LIMIT FOR COOLING PERIOD	LOWER LIMIT FOR COOLING PERIOD	UPPER LIMIT FOR COOLING PERIOD
Office work	Sitting ~ 1.2 met	Category I		+0.2 / +25.5 °C		$\theta_i = 0.33\theta_{rm} + 18.8$ °C + 2 K
		Category II		+0.5 / +26.0 °C		$\theta_i = 0.33\theta_{rm} + 18.8$ °C + 3 K
		Category III	-0.7 / +22.0 °C	+0.7 / +27.0 °C	$\theta_i = 0.33\theta_{rm} + 18.8$ °C - 4 K	$\theta_i = 0.33\theta_{rm} + 18.8$ °C + 4 K
Distribution and sales – I	Standing, walking ~ 1.6 met	Category I		+0.2 / +24.0 °C		$\theta_i = 0.33\theta_{rm} + 18.8$ °C + 2 K
		Category II		+0.5 / +25.0 °C		$\theta_i = 0.33\theta_{rm} + 18.8$ °C + 3 K
		Category III	-0.7 / +20.0 °C	+0.7 / +26.0 °C	$\theta_i = 0.33\theta_{rm} + 18.8$ °C - 6 K	$\theta_i = 0.33\theta_{rm} + 18.8$ °C + 4 K

Distribution and sales – II	Working ~ 2.0 met	Category I		+0.2 / +25.5 °C*		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 2\ K$
		Category II		+0.5 / +26.0 °C*		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 3\ K$
		Category III	-0.7 / +17.0 °C*	+0.7 / +27.0 °C*	$\theta_i = 0.33\theta_{rm} + 18.8\ °C - 9\ K$	$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 4\ K$
Production, manual and machine work, experiment – I	Working ~ 1.6 met	Category I		+0.2 / +24.0 °C		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 2\ K$
		Category II		+0.5 / +25.0 °C		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 3\ K$
		Category III	-0.7 / +20.0 °C	+0.7 / +26.0 °C	$\theta_i = 0.33\theta_{rm} + 18.8\ °C - 6\ K$	$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 4\ K$
Production, manual and machine work, experiment – II	Working ~ 2.0 met	Category I		+0.2 / +22.0 °C*		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 2\ K$
		Category II		+0.5 / +23.0 °C*		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 3\ K$
		Category III	-0.7 / +17.0 °C*	+0.7 / +24.0 °C*	$\theta_i = 0.33\theta_{rm} + 18.8\ °C - 9\ K$	$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 4\ K$
Residential and recreation	Sitting ~ 1.2 met	Category I		+0.2 / +25.5 °C		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 2\ K$
		Category II		+0.5 / +26.0 °C		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 3\ K$
		Category III	-0.7 / +22.0 °C	+0.7 / +27.0 °C	$\theta_i = 0.33\theta_{rm} + 18.8\ °C - 4\ K$	$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 4\ K$

Education, teaching and culture	Sitting ~ 1.2 met	Category I		+0.2 / +25.5 °C		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 2\ K$
		Category II		+0.5 / +26.0 °C		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 3\ K$
		Category III	-0.7 / +22.0 °C	+0.7 / +27.0 °C	$\theta_i = 0.33\theta_{rm} + 18.8\ °C - 4\ K$	$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 4\ K$
Kindergarten	Standing, walking ~ 1.4 met	Category I		+0.2 / +24.5 °C		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 2\ K$
		Category II		+0.5 / +25.5 °C		$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 3\ K$
		Category III	-0.7 / +21.0 °C	+0.7 / +26.0 °C	$\theta_i = 0.33\theta_{rm} + 18.8\ °C - 5\ K$	$\theta_i = 0.33\theta_{rm} + 18.8\ °C + 4\ K$

* Values determined in accordance with DIN EN I

For analysis of temperatures falling below limit values in the cooling period, the permitted lower limit from **Category III** can generally be used regardless of the classification.

If the levels of activity or the clothing factors do not correspond to the actual use conditions, the PMV can be verified as an alternative to the operative temperature. The selected boundary conditions must be verified. The clothing factor must be applied consistently for the cooling period.

As per DIN 15251, the adaptive comfort model only applies to sitting tasks with a level of activity between 1.0 and 1.3 met. In accordance with DIN EN 15251, an adaptive comfort model is permitted here as a conversion table, even for uses with a high level of activities. The upper limit is set similarly for sitting activities. The lower limit is shifted downwards in accordance with the level of activity. In the table shown above, the upper and lower limits for each scheme are specified.

Permitted maximum values for the indoor air temperature in work areas in accordance with workplace regulation A3.5, portion of industrial work
For the cooling period, a maximum indoor air temperature in accordance with workplace regulation A3.5 of 26 °C is initially assumed. However, changes to the limit are permitted, but a maximum limit value of 30 °C is set for the verification of industrial workstations.

Requirements for summer heat protection (MIN_FAC)

Table 1: Definition of **MIN_FAC**

	MECHANICALLY HEATED BUILDING (OFFICES AND SIMILARLY USED SPACES)	BUILDING WITHOUT ACTIVE COOLING OR WITHOUT AIR CONDITIONING
MIN_FAC	$S_{HP,} = W_{WR} \cdot g_t \leq 0.16 = S\ hp,_{max}$	$SHP = W_{WR} \cdot g_t \leq 0.16 = S\ hp,_{max}$

where:

W_{WR} is the window to wall ratio = window area / wall area
window area = sum of all windows (including window frames and mullions)
wall area = area of the exterior wall (width * floor to ceiling height) including all transparent and opaque parts of the wall

g_t is the combined total shading coefficient of window system, glazing and sun protection.

S_{HP} (Solar Heat Protection) is the factor to avoid overheating for office rooms according to DIN EN 13363
Alternative: Thermal, solar and daylight properties of building components and elements according to either detailed calculation method ISO 52022-3:2017 or Simplified calculation method of the solar and daylight characteristics for solar protection devices combined with glazing ISO 52022-1:2017.

APPENDIX 4

Permitted verification processes

The methods listed below are accepted for the verification of the indicators listed in the criterion or fulfilment of the relevant requirements.

Indicators 1 and 5: Operative temperature

1. Zonal thermal room simulation

Thermal room simulation carried out on a zonal basis (= thermal building simulation) must be performed by an expert, for more details refer to the criterion ENV1.1 Appendix 2.1 – “Basic principles and relevant standards for the dynamic building simulation. The software used for the simulation must be validated in accordance with DIN EN 15265 and/or DIN EN 15255, or ASHRAE 140: 2011 (or latest) standards, for more options refer to the ENV1.1 Appendix 2 and 4.
The simulation results regarding thermal comfort during the heating period must only be evaluated for this time frame (in accordance with DIN EN 15251, the heating period is defined as the time over which the building must be heated). This means that only the heating period may be used for the assessment of the permitted frequency of falling below and exceeding the limits (not the entire year).
If more precise data regarding the heating period is not available, for the purposes of simplification, the period from 1st November to 30th April can be assumed as the heating period.
The simulation results regarding thermal comfort in the cooling period must only be evaluated for the cooling period (in accordance with DIN EN 15251, the cooling period is defined as the time over which the building does not need to be heated). This means that only the cooling period may be used for the assessment of the permitted frequencies of exceeding and falling below the limits (not the entire year).
If more precise data regarding the cooling period (= non-heating period) is not available, for the purposes of simplification, the period from 1st May to 31st October can be assumed.

The simulations regarding thermal comfort must be based on the current weather data provided by local Meteorological Services for the relevant site (= test reference year for the region). Assessment have to be performed using the microclimate of the building site location (e.g. "urban heat island" for inner city locations), using typical meteorological climate data in hourly values for the location (test reference year), adopted to the local climate known from the past 30 years.
If suspended ceilings and/or sound-absorbing panels are planned in order to ensure that the acoustic conditions of the room are good, the acoustic elements evaluated in criterion SOC1.3 Acoustic comfort must be taken into account during the thermal simulations.

Information:
The zonal thermal room simulation can be used to document the following indicators:

- Operative temperature (= average value in the room)
- Radiant temperature asymmetry and floor temperature (= average value for the surface temperature in the room)
- Relative air humidity (= average value in the room).

2. Measurement in accordance with DIN EN 15251

The measurements for verification of the thermal comfort in the heating and cooling period must meet the requirements for comfort measurements in accordance with DIN EN 15251:

- The measurements must be carried out in representative rooms in typical operating phases.
- The measurements must be carried out under typical weather conditions for the cold or warm season as applicable. This means that the measurements in the heating period must be carried out at or below the statistically average exterior temperature for the three coldest months of the year. In the cooling period, the measurements must be carried out at or above the statistically average exterior temperature for the three warmest months of the year.
- The duration of the temperature measurements should be selected such that it is representative.
- The measuring device used for evaluation of the thermal indoor climate must meet the requirements for measuring accuracy specified in DIN EN ISO 7726.

Information:
The thermal comfort measurements can be used to document the following indicators:

- Operative temperature (= at selected, representative workstations)
- Drafts (= at selected, representative workstations)
- Radiant temperature asymmetry and floor temperature (= interior surface temperatures)
- Relative humidity (= at selected, representative workstations).

3. Calculation of the heating load in accordance with DIN EN 12831 or calculation of the cooling load in accordance with EN 16798 (Module M4 from the modular structure of the EN ISO 52000-1)

As an alternative, documentation can be carried out on the basis of the room using the calculation of the heating load in accordance with DIN EN 12831 or the calculation of the cooling load in accordance with EN 16798, if the following conditions have been met for the room being verified:

Definition of the window area proportion: The reference area is the façade area visible from the inside.

For the heating period:

Window area proportion of f < 40%

- The room being verified has a window area proportion of f < 40%.
- The lower limits for the operative temperature specified in Appendix 2 are determined via calculation of the heating load in accordance with DIN EN 12831 for the sizing of the heating system.

Window area proportion of f ≥ 40%

Documentation can be carried out via the calculation of the heating load in accordance with DIN EN 12831 if the room is heated via a rapid regulating heating system (e.g. heating sail, radiator, convection heater) with single-room regulation. The following conditions must also be met:

- The room being verified has a window area proportion of f between 40% and 70% with a U_w value of ≤ 1.3 W/m²K.
- The room being verified has a window area proportion with reference to the façade of f > 70% with a U_w value of ≤ 1.0 W/m²K.
- Heating systems integrated into components (e.g. underfloor heating, capillary tube mats) are not rapid regulating heating systems. This means that documentation of the calculation of the heating load in accordance with DIN EN 12831 is not permitted in such cases.
- In order to compensate for the difference between the operative temperature and the air temperature caused by the higher window area proportion (f ≥ 40%), the air temperature as per the calculation of the heating load in accordance with DIN EN 12831 (= design temperature) must be 1 K above the temperatures specified for Categories I, II and III in Appendix 2, in order to achieve the same number of checklist points.

Sales rooms or showrooms (AG > 100 m²)

- For large sales rooms or showrooms (AG > 100 m²), documentation via the calculation of the heating load in accordance with DIN EN 12831 is generally permitted.

As the static calculation of the heating load in accordance with DIN EN 12831 cannot provide information regarding instances where the temperature falls below or exceeds the design temperature, documentation of the frequency of falling below and exceeding the temperature is not required for this verification process, for the purposes of simplification.

For the cooling period:

Window area proportion of f < 40%

- The room being verified has a window area proportion of f < 40%.
- The room has active cooling (air-based cooling or radiant cooling).
- The façade has external solar radiation protection.
- The upper limits for the operative temperature specified in Appendix 3 for cooled buildings are determined via calculation of the cooling load for the sizing of the cooling system.

Window area proportion of f ≥ 40%

- The room being verified has a window area proportion of f ≥ 40%.
- The façade has external solar radiation protection.
- A quickly regulating cooling system with single-room regulation is used.
- The cooling system uses both convection cooling and radiant cooling (e.g. cooling sail, chilled ceiling). For purely convective systems (e.g. underfloor convector, fan coils), documentation via calculation of the cooling load is not permitted at higher window area proportions (f ≥ 40%).
- Cooling systems integrated into components (e.g. underfloor cooling, structural component tempering, capillary tube mats) are not rapid regulating cooling systems. This means that documentation of the calculation of the cooling load in accordance is not permitted in such cases.
- A mechanical ventilation system with dehumidification ensures that the cooling system can be continually operated without power losses-. If the only available ventilation is via window ventilation or

a ventilation system without dehumidification, this requirement is not met.

- The upper limits for the operative temperature specified in Appendix 3 for cooled buildings are determined via calculation of the cooling load for the sizing of the cooling system.

As the static calculation of the cooling load cannot provide information regarding instances where the temperature falls below or exceeds the design temperature, documentation of the frequency of falling below and exceeding the temperature is not required for this documentation process, for the purposes of simplification.

For rooms that are not cooled or rooms that are categorised as being without cooling, this simplified method is not permitted in principle.

4. Other methods

For verification of the thermal comfort in the heating and cooling periods, methods other than those listed above are generally not permitted.

Information regarding documentation of summer heat protection in accordance with DIN 4108-2:

- Documentation of summer heat protection must be carried out in accordance with the version of DIN 4108-2 applicable for certification under public law (EnEV certification [T&D_03]). Alternatively, documentation in accordance with a newer version of DIN 4108-2 is permitted.
- For documentation of summer heat protection in accordance with DIN 4108-2, the estimated total energy transmittance g_{tot} must be verified in addition to compliance with the maximum permitted solar transmittance parameter $S_{max,per}$. In addition, the components of this value, the estimated total energy transmittance of the glazing g and the reduction level of the sun protection F_c used must be verified, justified and supplied together with a list of references.

Indicators 2 and 6: Drafts

The input parameters required by the drafts model in DIN EN ISO 7730 are the indoor air temperature, the average airspeed and the standard deviation of the air velocity (or degree of turbulence; a degree of turbulence of 40 to 50% must be assumed for mixing ventilation, while a degree of turbulence of 20 to 25% must be assumed for displacement ventilation [EN 16798]).
The method in accordance with DIN EN ISO 7730, Annex A, Figure A.2 can be used in temperature ranges of 20 °C to 26 °C. This model is used to provide an ideal point of reference for evaluation of the drafts indicator.
For buildings without indoor air ventilation (HVAC) systems, this requirement is generally considered to have been complied with. Drafts are known to form as a result of opened windows. However, users can stop drafts themselves by closing the windows.
Regardless of the documentation process, documentation must generally be compiled for all types of air outlets and ventilator-driven air flows, (e.g. ventilation systems, circulation heaters, convection heaters with blowers, etc.).

The following methods are acceptable for documenting drafts:

- Characteristics of the air outlets – Manufacturer specifications
- The characteristics of the air outlets as provided by the manufacturers can be used to determine the air velocity relative to the distance from the air outlet. The air velocity must not exceed the maximum permitted value in the open space closest to the air outlet.
- Flow simulations

- Alternatively, the airflow in the room can also be determined using high-resolution CFD flow simulations. When doing so, the air velocity in the open space must not exceed the maximum permitted value.
- Measurements
- Alternatively, the air velocity can also be determined using measurements for representative open spaces. When doing so, the airspeed in the open space must not exceed the maximum permitted value.

Indicators 3 and 7: Radiant temperature asymmetry and floor temperature
The permitted documentation processes depend on the type of component:

- Heated/cooled components
- Verification is carried out via documentation of the design.

For the heating period only:

- Non-heated, opaque components
- If the U-values in accordance with criterion TEC1.3 are complied with, it is to be assumed that the criteria for minimum temperatures are also met.
- Non-heated, transparent components
- Only the following documentation processes are permitted:

a) Zonal thermal simulation
Compliance with the permitted interior surface temperatures is verified via an additional evaluation of the zonal thermal room simulation. Here, the temperatures may, in the same way as for indicator 1, exceed or fall below the permitted limit values for no more than 3% or 5% (depending on the category that is to be complied with) of the winter usage period in total (time reference as in indicator 1: Winter heating period, not the entire year).

b) One-dimensional heat flow calculation
If compliance with the permitted interior surface temperatures is verified using one-dimensional heat flow calculations, the following boundary conditions must be applied:
Exterior temperature: -5 °C
Interior temperature: 20 °C
Heat transfer resistance in accordance with DIN EN ISO 6946:
External: R_a = 0.04 m²K/W
Internal: Heat flow
Upwards: R_i = 0.10 m²K/W
Horizontal: R_i = 0.13 m²K/W
Downwards: R_i = 0.17 m²K/W

c) Simplified table method

If no simulations or one-dimensional heat flow calculations have been carried out, documentation can be compiled via a simplified method using the table below.

WINDOW AREA PROPORTION WITH REFERENCE TO THE FAÇADE BY ROOM	REQUIREMENT OR DOCUMENTATION
f ≤ 40 %	The requirement is considered to be met.
40% < f ≤ 70%	At a heat transfer coefficient for the windows of U_w ≤ 1.3 W/(m²K) [1] and a radiator positioned under the glazing, this requirement is considered to be met.
f > 70%	The heat transfer coefficient of the windows is equal to or less than U_w ≤ 1.0 W/(m²K)².

1. for the projects in various climatic zones: compliance with minimum national requirements for the Heat transfer coefficients or Optional U - Values (minimum requirement) for the various climatic zones according to the Appendix 1 of criteria TEC1.3

2. for the projects in various climatic zones: 25% Overachievement of the minimum national requirements for the Heat transfer coefficients or Optional U - Values (minimum requirement) for the various climatic zones according to the Appendix 1 of criteria TEC1.3

For cooling period only:

For non-cooled components (particularly glass façade(s)), the following applies:

d) No documentation required for small windows (f < 40%)

Documentation of the maximum inner surface temperatures of the glass façade is not required for rooms with a window area proportion of f < 40%. The window area proportion f relates to the internal façade surface(s) or the façade surface(s) visible from the inside.

e) Documentation for external solar radiation protection:

Documentation for external solar radiation protection can be carried out via a representation of the overall concept for the façade/solar radiation protection/cooling system. When doing so, the thermal qualities of the components, the position and type of solar radiation protection, and the arrangement and operation of the ventilation and cooling systems must be shown and specified.

f) Larger windows (f ≥ 40%) without external solar radiation protection:

If larger windows (f ≥ 40%) are used without external solar radiation protection, the maximum interior surface temperatures must additionally be verified via suitable simulation calculations. Only zonal room simulations, CFD flow simulations or spectral calculations in accordance with DIN EN 13363-2 or ISO 15099 are permitted for this purpose.

I. Zonal room simulation
Compliance with the permitted interior surface temperatures is verified via an additional evaluation of the zonal thermal room simulation. Here, the temperatures may, in the same way as for indicator 5, exceed or fall below the permitted limit values for no more than 3% or 5% (depending on the category that is to be complied with) of the summer usage period in total (time reference as in indicator 5: Summer cooling period, not the entire year).

II. CFD flow simulation
Compliance with the permitted interior surface temperatures is verified via a high-resolution CFD flow simulation for a typical summer situation.

III. Spectral calculation in accordance with DIN EN 13363-2 or ISO 15099
If documentation is carried out via spectral calculations in accordance with DIN EN 13363-2 or ISO 15099, a maximum exterior temperature of +32 °C, a vertical global solar transmittance of 600 W/m² for south-facing façades or 720 W/m² for east-facing or west-facing façades (EN 16798-11), and an indoor air temperature of 26 °C must be attained.

Indicators 4 and 8: Indoor humidity

The permitted documentation processes depend on whether the room is equipped with a ventilation system with a humidification function:

(1) Mechanical ventilation system with humidification and dehumidification function

Verification is carried out via documentation of the design of the ventilation system

(2) Rooms without humidification or dehumidification via the mechanical ventilation system, or without window ventilation

For the heating period:

Zonal moisture simulation
Thermal simulation is expanded to include moisture balances that represent the chronological progression of air humidity in the room. For thermal simulations including moisture balances, the high variation in window ventilation intensity depending on time must be represented via zonal ventilation simulation (air node network).
Here, the temperatures may fall below or exceed the permitted limit value for no more than 5% of the winter usage period in total (time reference as in indicator 1: Winter heating period, not the entire year).

For the cooling period:

Zonal moisture simulation
Thermal simulation is expanded to include moisture balances that represent the chronological progression of air humidity in the room. For thermal simulations including moisture balances, the high variation in window ventilation intensity depending on time must be represented via zonal ventilation simulation (air node network).
The limit values for air humidity (see above) in accordance with DIN EN 15251 are considered to have been complied with if they have been achieved for at least 95% of the summer usage period (time reference as in indicator 5: Non-heating period, not the entire year); this means that temperatures exceeding or falling below the limit values are permitted for no more than 5% of the summer usage period.

SOC1.2

Indoor air quality

Objective

Our aim is to ensure that indoor air is of sufficient quality not to adversely affect users' health and well-being.

Benefits

Nowadays humans spend up to 90 percent of their time in closed rooms. The indoor air quality therefore plays a significant role concerning performance and health. Ensuring high air quality in rooms by using low-emission products and providing an adequate air exchange rate increases users' well-being, productivity and satisfaction.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	3.4	Reduction of premature death, promotion of good health/well-being	3.1.a/b	Health and food
	3.9	Effects of chemicals, air, water and soil contamination	3.2.a	Air pollution
	12.4	Environmentally friendly handling of chemicals and waste		

Outlook

The target and reference values are based on scientific findings. If these findings advise further tightening, this will likely be reflected in the future formulation of the criterion.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Assembly buildings**	**5.1%**	**5**
Residential **Logistics** **Production**	**5.4%**	**5**
Hotel	**4.9%**	**5**
Consumer market **Department stores** **Shopping centre** **Education**	**4.5%**	**4**

EVALUATION

The "indoor air quality" criterion is an exclusion criterion in the DGNB certification system (this does not apply to the new construction retail and new construction industrial schemes). A building that does not meet the minimum requirements for indoor air quality cannot be certified.

Ensuring indoor air that does not adversely affect users is evaluated via the indoor air concentration of volatile organic compounds (VOCs) (indicator 1) and via the ventilation rate (indicator 2). Improvements to the indoor air quality via innovative solutions can be acknowledged via an innovation area.

As a prerequisite for the assessment of this criterion, indicator 1 has to meet the minimum indoor air quality requirements, i.e. at least 10 points either with indoor air quality measurement ≤ 4 weeks (alternatively 5 points with indoor air quality measurement > 4 weeks) after the completion of the examined rooms, or building material declaration is required. This is linked to compliance with quality level 3 in accordance with the criteria ENV 1.2. The worst measured value is used for the evaluation of the indoor air concentration. The use of intermediate values is not possible. A total of 100 points can be achieved for this criterion or a maximum of 105 points including bonuses.

NO.	INDICATOR		POINTS
1	**Indoor air quality – Volatile organic compounds (VOCs)**		
1.1	**Measurement of volatile organic compounds**		
	Office **Education** **Hotel** **Assembly buildings**		
	■ Evaluation of the indoor air concentration of volatile organic compounds according to the ISO 16000-6, -3 standards		
	TVOC [µg/m³]	Formaldehyde [µg/m³]	**Max. 50**
	> 3000	> 100	0
	≤ 3000	≤ 100	10
	≤ 1000	≤ 60	25
	≤ 500	≤ 30	50
	Alternatively:		
	■ Evaluation of incomparable VOC measurements according to the ISO 16000-6, -3 standards (measured more than four weeks after completion)		
	TVOC [µg/m³]	Formaldehyde [µg/m³]	**Max. 25**
	> 3000	> 100	0
	≤ 3000	≤ 100	5
	≤ 300	≤ 30	25
	Alternatively:		
	■ Evaluation of the indoor air concentration of volatile organic compounds according to the EPA (Environmental Protection Agency US) Standards TO-1 / TO-15 / TO-17 and TO-11A (Formaldehyde)		**Max. 40**
	TVOC [µg/m³]	Formaldehyde [µg/m³]	
	> 3000	> 100	0
	≤ 3000	≤ 100	10
	≤ 1000	≤ 60	20
	≤ 300	≤ 30	40
	Alternatively:		
	■ Evaluation of incomparable VOC measurements according to the EPA		**Max. 20**

Standards TO-1 / TO-15 / TO-17 and TO-11A (measured more than four weeks after completion)

TVOC [µg/m³]	Formaldehyde [µg/m³]	
> 3000	> 100	0
≤ 3000	≤ 100	5
≤ 300	≤ 30	20

Alternatively:

- Evaluation of the indoor air concentration of volatile organic compounds according to the ASHRAE 189.1- 2014 (TVOC reporting shall be in accordance with CDPH (California Department of Public Health) Standard Method V1.1 and shall be in conjunction with the individual VOCs listed in Annex 3). Max. 20

TVOC [µg/m³]	Formaldehyde [µg/m³]	
> 500	> 100	0
< 500	< 100	10
< 200	< 30	20

Alternatively:

- Evaluation of the indoor air concentration of volatile organic compounds according to the National (local) Regulation[1] **Variable**

Residential

- If representative measurements are not possible for ≥ 80% of the common rooms due to the implemented tenant fit out, the lower evaluation must be applied. (Evaluation of the indoor air concentration of volatile organic compounds according to the ISO 16000-6, -3 standards)

TVOC [µg/m³]	Formaldehyde [µg/m³]	< 80% /	≥ 80%	**Max. 30/50**
> 3000	> 100	0	0	0
≤ 3000	≤ 100	5	10	5/10
≤ 1000	≤ 60	10	25	10/25
≤ 500	≤ 30	30	50	30/50

Alternatively:

- Evaluation of incomparable VOC measurements according to the ISO 16000-6, -3 standards (measured more than four weeks after completion)

TVOC [µg/m³]	Formaldehyde [µg/m³]	< 80%	≥ 80%	**Max. 10/15**
> 3000	> 100	0	0	0
≤ 3000	≤ 100	5	5	5
≤ 300	≤ 30	10	15	10/15

Alternatively:

- If representative measurements are not possible for ≥ 80% of the common rooms due to the implemented tenant fit out, the lower evaluation must be applied (Evaluation of the indoor air concentration of volatile organic compounds according to the EPA Standards TO-1 / TO-15 / TO-17 and TO-11A (Formaldehyde))

TVOC [µg/m³]	Formaldehyde [µg/m³]	< 80% /	≥ 80%	**Max. 25/40**
> 3000	> 100	0	0	0
≤ 3000	≤ 100	5	10	5/10

[1] TVOC and Formaldehyde measurement methods, concentration limit values and max. points, to be agreed with DGNB

≤ 1000	≤ 60	10	20	10/20
≤ 300	≤ 30	20	40	20/40

Alternatively:

- Evaluation of incomparable VOC measurements according to the EPA Standards TO-1 / TO-15 / TO-17 and TO-11A (measured more than four weeks after completion)

TVOC [µg/m³]	Formaldehyde [µg/m³]	< 80%	≥ 80%	**Max. 7.5/10**
> 3000	> 100	0	0	0
≤ 3000	≤ 100	5	5	5
≤ 300	≤ 30	7.5	10	7.5/10

Alternatively:

- If representative measurements are not possible for ≥ 80% of the common rooms due to the implemented tenant fit out, the lower evaluation must be applied (Evaluation of the indoor air concentration of volatile organic compounds according to the ASHRAE 189.1- 2014 (TVOC reporting shall be in accordance with CDPH (California Department of Public Health) Standard Method V1.1 and shall be in conjunction with the individual VOCs listed in Annex 3)). **Max. 5**

TVOC [µg/m³]	Formaldehyde [µg/m³]	< 80% /	≥ 80%	
> 500	> 100	0	0	0
< 500	< 100	5	10	5/10
< 200	< 30	10	20	10/20

- Additional points for tenant obligations if representative measurements of ≥ 80% of the common rooms are not possible due to the tenant fit out:
  It is documented that the tenants/apartment owners have undertaken to implement at least 50% of the total rental spaces in accordance with quality level 3 of the criterion "ENV1.2 Local environmental impact" and that compliance with the requirements after completion of the rental space corresponds to the following results:
  Evaluation of the indoor air concentration of volatile organic compounds according to the ISO 16000-6, -3 standard

TVOC [µg/m³]	Formaldehyde [µg/m³]	**Max. 15**
≤ 3000	≤ 100	5
≤ 1000	≤ 60	10
≤ 500	≤ 30	15

Alternatively:

Evaluation of the indoor air concentration of volatile organic compounds according to the EPA Standards TO-1 / TO-15 / TO-17 and TO-11A (Formaldehyde)

TVOC [µg/m³]	Formaldehyde [µg/m³]	**Max. 10**
≤ 3000	≤ 100	5
≤ 1000	≤ 60	7.5
≤ 300	≤ 30	10

Alternatively:

Evaluation of the indoor air concentration of volatile organic compounds

according to the ASHRAE 189.1- 2014 (TVOC reporting shall be in accordance with CDPH (California Department of Public Health) Standard Method V1.1 and shall be in conjunction with the individual VOCs listed in Annex 3).

TVOC [µg/m³]	Formaldehyde [µg/m³]	**Max. 5**
≤ 500	≤ 100	2.5
≤ 200	≤ 30	5

Alternatively:

- Evaluation of the indoor air concentration of volatile organic compounds according to the National (local) Regulation[2] **Variable**

Shopping centre **Department stores** **Max. 30**

- Only low-emission construction products are used in the communal areas. The products are declared in full and are in compliance with the quality level 3 according to the ENV1.2. +15
- It is documented that the tenants have undertaken to comply with quality level 3 as a minimum in accordance with ENV1.2 for at least 50% of the rental spaces and have confirmed compliance after completion of the rental space. 10
- It is documented that the tenants have undertaken to comply with quality level 3 as a minimum in accordance with ENV1.2 for at least 80% of the rental spaces and have confirmed compliance after completion of the rental space. 15

Logistics **Production** **Max. 50**

- A declaration has been carried out and documented for all products of the floor surfaces. The products are fulfilling at least quality level 3, according to the ENV1.2. 25
- A declaration has been carried out and documented for all products of the floor surfaces and other interior surfaces. The products are fulfilling at least quality level 3, according to the ENV1.2. 40
- In addition, evaluation of the indoor air concentration of volatile organic compounds in compliance with the ISO 16000-6, -3 standard

TVOC [µg/m³]	Formaldehyde [µg/m³]	**+Max. 10**
> 3000	> 100	0
≤ 3000	≤ 100	5
≤ 1000	≤ 60	7.5
≤ 500	≤ 30	10

Alternatively:

evaluation of the indoor air concentration of volatile organic compounds in compliance with the EPA Standards TO-1 / TO-15 / TO-17and TO-11A

TVOC [µg/m³]	Formaldehyde [µg/m³]	**Max. 7.5**
> 3000	> 100	0
≤ 3000	≤ 100	2.5
≤ 1000	≤ 60	5
≤ 300	≤ 30	7.5

[2] TVOC and Formaldehyde measurement methods, concentration limit values and max. points, to be agreed with DGNB

Alternatively:

evaluation of the indoor air concentration of volatile organic compounds in compliance with the ASHRAE 189.1- 2014 (TVOC reporting shall be in accordance with CDPH (California Department of Public Health) Standard Method V1.1 and shall be in conjunction with the individual VOCs listed in Annex 3).

TVOC [µg/m³]	Formaldehyde [µg/m³]	**Max. 5**
> 500	> 100	0
≤ 500	≤ 100	2.5
≤ 200	≤ 30	5

Alternatively:

- Evaluation of the indoor air concentration of volatile organic compounds according to the National (local) Regulation[3] **Variable**

Consumer market **30**

Assembly buildings exception: **25**

- A declaration has been carried out and documented.

Remark: according to the "IV. Usage-specific description", certain rooms in **Assembly buildings,** can be assessed by means of a declaration.

1.2 **AGENDA 2030 BONUS – REDUCTION IN POLLUTANT EMISSIONS IN THE INDOOR AIR, HEALTH AND WELL-BEING** **+Max. 5**

Objective of the AGENDA 2030 BONUSES is to reduce premature death and promote good health and well-being.

1.2.1 Protection of non-smokers: People are not adversely affected by other people smoking within the building or surrounding zones. In the surrounding outside areas, suitable measures are in place to ensure that cigarette smoke cannot enter the building. +2.5

1.2.2 Particulate matter in interiors: Particulate matter pollution due to copiers and laser printers is prevented by using low-emission inkjet printers or by installing copiers and laser printers in a separate printer room with sufficient ventilation. +2.5

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2 Indoor air quality – Ventilation rate

2.1 Air exchange rate

Office **Education** **Hotel** **Assembly buildings**

Mechanical ventilation systems according to EN 15251 or DIN EN 16798-1 **Max. 50**

EN 15251	Description	
IV	Values outside categories I to III; should only be used for a limited period of the year	0
III	Acceptable, moderate expectations; can be used for existing buildings.	25
I and II	Normal expectations; recommended for new and renovated buildings	50

[3] TVOC and Formaldehyde measurement methods, concentration limit values and max. points, to be agreed with DGNB

Alternatively:

Natural ventilation through opening windows **Max. 25**

Category	Description	
	no verification	0
Workplace regulation A 3.6	The requirements of workplace regulation A (continually 3.6) are met. Ventilation or boost ventilation. See Appendix A	25

Alternatively:

Zonal flow simulation **Max. 50**

EN 15251	CO_2 concentration higher than the exterior air concentration [ppm]	
IV	> 800	0
III	> 500 and ≤ 800	25
I and II	≤ 500	50

If 25 points have been achieved through both mechanical ventilation and compliance with the workplace regulation via boost ventilation, the combination of mechanical ventilation and natural ventilation is awarded 50 points.

Shopping centre **Department stores** **Consumer market**

Note regarding **Shopping centre** : Evaluation of this indicator can be carried out by means of different classification of the mall and the shops. The mall is documented separately (total max. 70 points).

Mechanical ventilation systems according to EN 15251 or DIN EN 16798-1 **Max. 70**

EN 15251	Description		
IV	Values outside categories I to III; should only be used for a limited period of the year.		0
III	Reasonable, moderate expectations; can be used for existing buildings	**Shopping centre (shops)**	
		(Mall)	25
		Department stores	10
		Consumer market	35
			30
I and II	Normal expectations; recommended for new and renovated buildings	**Shopping centre (Shops)**	
		(Mall)	50
		Department stores	20
		Consumer market	70
			70

Residential **Max. 50**

- Creation of a ventilation concept in accordance with DIN 1946 Part 6 — 15
- Ventilation measures with implementation of ventilation stages: RL — 35
- Ventilation measures with implementation of ventilation stages: RL/NL* — 50

*If the result of the calculation in accordance with DIN 1946-6 is that the air flow rate via infiltration per unit in m3/h is sufficient to cover the air flow rate for moisture protection in accordance with DIN 1946-6, this requirement is considered to have been met.

Unoccupied periods (vacancy): If no values have been defined at national level, the ventilation rate for moisture protection (FL) is recommended for unoccupied periods.

Logistics **Production**

Natural ventilation through opening windows or mechanical ventilation	**Max. 50**
■ No verification	0
■ The requirements of workplace regulation A 3.6 are met. See Appendix A	25
■ Regulation of ventilation as required	40
■ Over-fulfilment of the hygienically required minimum air exchange by at least 20%.	50

Re 2 **INNOVATION AREA** **As in 2.1.**

Explanation: If the indoor air quality is verifiably improved by alternative, innovative solutions, points can be awarded accordingly.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate parameters (KPIs) for communication include measurement TVOCs and formaldehyde results determined in indicator 1 as well as the air exchange rate and the maximum CO_2 concentration. The findings can also be used for reporting in accordance with the "Level(s) – Common EU framework of core environmental indicators". The results of the indoor air measurement can be used for this.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Measured value for TVOCs (with number/share of the rooms for which the measured values are applicable)	[µg/m³]
KPI 2	Measured value for formaldehyde (with number/share of the rooms for which the measured values are applicable), corresponds to elements of the Level(s) indicator 4.1.2	[µg/m³]
KPI 3	Total ventilation rate (with number/share of the rooms for which the ventilation rate is applicable), corresponds to elements of the Level(s) indicator 4.1.1	[l/s]
KPI 4	Maximum CO_2 concentration in 95% of the use time (with number/share of the rooms for which the maximum CO_2 concentration is applicable), corresponds to elements of the Level(s) indicator 4.1.1	[%]

Synergies with DGNB system applications

- **DGNB BUILDINGS IN USE :** Achieving a good level of indoor air quality (criterion SOC9.1 of the scheme for buildings in use) is indirectly positively evaluated for users´ satisfaction.
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion SOC1.2 of the scheme for renovated buildings.
- **DGNB INTERIORS:** High synergies with criterion SOC1.2 of the scheme for interiors.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

II. Additional explanation

If TVOC and formaldehyde concentrations, exceeding limit values listed in the evaluation tables above or the transgression of Guide value 2 according to Annex 2 or Regulatory and Advisory numbers according to Annex 3, endanger hygiene of rooms in dwellings, offices or teaching rooms used by the same persons for several hours, buildings with these high pollution levels are excluded from certification.
In rooms where occupants stay only for few hours and change on a continuous basis (e.g. sales rooms, film screening rooms) , appropriate methods must be applied to reduce the abovementioned danger to hygiene to the lowest possible level. Buildings presenting an identifiable risk to health must be excluded from certification.
Rooms where surrounding building components present only a limited threat and rooms which are not used on a continuous basis (e.g. large sheds or warehouses) present a limited risk to health. The objective is for building materials and methods in rooms of this type to present only limited pollution levels.

In the analyses specified above, unpleasant olfactory perception should be additionally avoided.

III. Method

Indoor air quality (IAQ) is evaluated on the basis of a checklist including various indicators, which are combined to arrive at a total score. The following indicators are assessed as part of the checklist:

Indicator 1: Indoor air quality – Volatile organic compounds (VOCs)
For this indicator, there is a purely planning-based evaluation approach in addition to the measurement-based approach. For buildings where the requirements for the subsequent indoor air situation has not or only partially been decided in the planning phase, e.g. because fitment is to be carried out by the tenant, a replacement method (low-emission products) is used.

Indicator 1.2: AGENDA 2030 BONUS – Reduction in pollutant emissions in the indoor air, health and well-being
The objective is to reduce premature death and promote good health and well-being of humans.

1.2.1 Protection of non-smokers
The harmful effects of smoking and passive smoking are firmly established. For this reason, people in the building or other surroundings should not be adversely affected by smoking. Suitable measures should be implemented, in and around the building, in order to prevent cigarette smoke entering the building from the outside.

1.2.2 Particulate matter in interiors
Ultra-fine particulate matter is particularly dangerous to humans. Copiers and laser printers in particular contribute to a significant increase in ultra-fine particulate matter in indoor air and increased concentrations of volatile organic compounds. Because every printing process expels ultra-fine particulate matter into the air, where it can cause damage to human respiratory organs, laser printers should be replaced with low-emission inkjet printers or copiers and laser printers should be installed in a separate printer room with sufficient ventilation.

Indicator 2: Indoor air quality – Air exchange rate
There are a number of different evaluation approaches for this indicator depending on the building use.

IV. Usage-specific description

Office **Education** **Residential** **Hotel** **Assembly buildings**

Indicator 1: Indoor air quality – Volatile organic compounds (VOCs)
The indoor air measurement is conducted in a random sample of rooms no more than four weeks after building completion (see table of the representative furnishing types). The building is deemed complete when all packages with a possible impact on indoor air quality, including building service installations, painting and commissioning of sanitary and ventilation systems, have been delivered. Furniture that is permanently installed in the building (e.g. built-in cupboards) are to be taken into account in the indoor air measurement, while furniture provided by the user (chairs, computer, table, etc.) is not.
In addition to the total TVOCs, the substances listed in Annex 2 or Annex 3 must be quantified individually and the concentration of formaldehyde in the indoor air must be determined.
The TVOC concentration and the formaldehyde content in the indoor air are determined on the basis of the relevant standards. The TVOC value is assessed in accordance with the specifications of:

- DIN ISO 16000-6;

Alternatively:

- US EPA (United States Environmental Protection Agency) compendium method TO-1 / TO-15 or TO-17: Determination of Volatile Organic Compounds,

Alternatively:

- TVOC value reported in accordance with the method described in the ASHRAE 189.1.

All other national or local standards and methods must be firstly agreed with DGNB in system adaptation process.

The formaldehyde concentration is assessed in accordance with the specifications of:

- DIN ISO 16000-3,

Alternatively:

- US EPA compendium method TO-11A,

Alternatively:

- Formaldehyde value reported in accordance with the methods described in the ASHRAE 189.1 standard.

All other national or local standards and methods must be firstly agreed with DGNB in system adaptation process

Ventilation of the selected rooms is carried out in accordance with the specifications of DIN EN ISO 16000-5. This process differentiates between naturally and mechanically ventilated rooms. Alternatively measurement procedure can be carried out according to the specifications described in ASHRAE 189.1-2014 standard under the chapter “post-construction, preoccupancy baseline IAQ monitoring”.

The assessment regarding the ventilation must be based on the following conditions:

- Naturally ventilated rooms are ventilated intensively for 15 minutes. Then, all doors and windows must be kept closed for at least eight hours preceding the measurement (preferably overnight). Finally, the measurement is conducted with all doors and windows closed.
- In rooms with mechanical ventilation, the plant should be operated as usual. The plant must be taken into use no less than three hours before the measurement is conducted. In rooms with a recommended ventilation pattern (e.g. schools, crèches) an entire cycle of typical use should be completed.

- The operation of the mechanical ventilation or the conditions of ventilation before the measurement must be documented in a Ventilation Protocol similar to that described in DIN EN ISO 16000-1, Annex D, sections D and E.

The ventilation must be coordinated with an accredited laboratory and the report regarding the ventilation must be presented as documentation.

Measurements taken at a later date are not comparable as a result of the building materials varying emission patterns. Levels measured at a later date can be accepted if they are lower than those required for hygiene.
In this case, the evaluation is carried out in accordance with Table 3 (Evaluation of incomparable VOC measurements).

TABLE 1 TABLE OF REPRESENTATIVE ROOMS

ROOMS IN THE BUILDING	TYPE OF ROOM	NUMBER OF ROOMS TO BE SAMPLED
≤ 100	All of the rooms within the building do have essentially the same interior (fit-out)	2
	Room interiors (fit-outs) vary throughout the building. Each room type accounting for more than 10% of NFA in the building must be tested [T&D_04]	1 per type
> 100	All of the rooms within the building do have essentially the same interior (fit-out)	3
	Room interiors (fit-outs) vary throughout the building. Each room type accounting for more than 10% of NFA in the building must be tested [T&D_04]	2 per type

Essentially similar room specifications are floor coverings, wall and ceiling surfaces and permanent installations that feature no significant differences with regard to the materials used and their emissions performance. Differences in colour, pattern, shape or manufacturer are not relevant.

This means, for example, that two textile coverings with different manufacturers and structures, both of which have been fixed in place with low-emission adhesives and certified with the *GUT* label (i.e. emissions controlled), can be considered to constitute a single, essentially identical room specification. Here it must be noted that TVOC and formaldehyde emissions from construction materials such as floor coverings can decay at different rates. Not all carpets are tested up to the TVOC end value of 300 or 100 µg/m³ guaranteed by the label (e.g. *GUT, RAL-UZ*). Formally, *AgBB* (Committee for the Health Assessment of Construction Products Emissions)-certified carpets are permitted to still display a test chamber concentration of up to ≤1.0 mg/m³ TVOC/m3 after 28 days. It is therefore recommended to take necessary decay times into account.

A building cannot be certified if it has a TVOC concentration exceeding 3000 µg/m³ (or 500 µg/m³ if measurement process refers to the ASHRAE 189.1 standard) or a formaldehyde content exceeding 100 µg/m³.

Any situation where the limits for the substances specified under guide value I (Annex 2) have been exceeded on a sustained basis is not acceptable. For this reason, a statement is required regarding instances where guide value I is exceeded, indicating the source of the substance or including a declaration regarding the decay behaviour. The same is valid also for the Annex 3 where the references “Health numbers” are provided. These values are used as a recommendation for exposure levels for chronic inhalation (i.e. > 8h per day). The ASHRAE 189.1 threshold values also serve as the orientation numbers and with a threshold violation a relevant statement (as described above) must be provided.
For evaluation of volatile organic compounds without guide values, the VOC guide values for new buildings determined as part of a research assignment of the German Federal Environment Agency must be used, see Annex 2. For substances with provisional odour reference values derived from the working group of interior guide values, odour reference value II is documented in each case. Values of this magnitude indicate that unpleasant odours can be expected.
Measured values higher than these comparison values indicate that the building studied features levels of indoor air VOC pollution that are higher than the background level to a statistically significant degree.
If significantly higher concentrations than would "normally" be expected occur for individual VOCs (this refers to the New Construction Benchmarks value in accordance with Annex 2), this does not result in the building being rejected, but does mean that an independent expert report must be presented alongside the test report, indicating the source of the substance or including a declaration regarding the decay behaviour. If this information is not provided, the measurement will not be accepted.
The recommendation of the expert (such as recommended ventilation or further measurement) in the event that levels of individual substances or of TVOCs and formaldehyde exceed the limit values must be made available to the client/building owner to enable measures to be taken at an early stage.
A template for the verification has been created to simplify the documentation process (see Annex 1).

Exception rule by **Assembly buildings :**
Assessment of **Assembly buildings** is based on above mentioned "usage-specific description" (such as **Education**).
In the case of certain “Assembly building” types, with constantly changing fitouts / exhibitions / inventory (e.g. exhibition halls), assessment can be carried out via a declaration of the surface/subsurface materials/products e.g. primers and top coatings, coverings and adhesives etc. The basis for the evaluation is the creation of a project-specific list with the division of room types:
Lounge (measurement according to "usage-specific description" such as **Education**)
Lounge area with constantly changing fitouts / exhibitions / inventory (assessment based on a declaration of surface/subsurface products/materials accordance with the "usage-specific description" such as **Consumer market**)
Rooms division is plausible and based on the use of the space. Rooms that are assessed by means of a declaration are included in the assessment with a weighted area of 25 points if the requirements of quality level 3 according to ENV 1.2 are met and verified for these rooms. The minimum requirement for indoor air quality measurement must be met.

Shopping centre **Department stores**

Due to the significant impact of the facilities installed, indoor air measurements are not included in the evaluation. The evaluation is carried out via declaration of the products used. In some circumstances, indoor air measurements can be used to monitor planning objectives.
A declaration is required for all products situated close to the surfaces in the communal areas and, if applicable, the rental spaces. These include, in particular, paints, varnishes and coatings on walls, ceilings and floors as well as adhesives and sealants. Declarations are produced on the basis of the specifications in criterion ENV1.2, Recording local impacts. The requirements of quality level 3 in accordance with ENV1.2 must be complied with and

documented.
Involving the tenants in the requirements for the construction materials is evaluated particularly positively.
Documenting that the tenants have undertaken to comply with quality level 3 as a minimum for at least 50% of the rental spaces and that compliance has been confirmed after completion of the rental space is evaluated positively.

Logistics **Production**

The indoor air quality of industrial buildings is affected quite significantly by the use of the building and the ventilation system in place. Users are subject to occupational health and safety requirements. In buildings where low-emission products are verifiably used in the interior, a comparatively low level of indoor air pollution can be expected. The evaluation is therefore not solely performed using the results of indoor air measurements. Indoor air measurements are a suitable method for monitoring planning objectives.
A declaration is required for all products situated close to the surfaces in work areas; these include, in particular, paints, lacquers and coatings on walls, ceilings and floors as well as adhesives and sealants. Declarations are produced on the basis of the specifications in criterion ENV1.2, Recording local impacts. The requirements of quality level 3 in accordance with ENV1.2 must be demonstrated and complied with. Involving the tenants in the requirements for the construction materials is evaluated particularly positively.

The measurement is conducted in a random sample of rooms no more than four weeks after building completion. In addition to the total TVOCs, the substances listed in Annex 2 must be quantified individually and the concentration of formaldehyde in the indoor air must be determined. The rooms must be selected such that the significant differences between the interior surfaces are recorded. If rooms are divided into smaller parts, at least two measurements must be carried out in different rooms. In the case of a single large hall, one or more measurements and a ventilation system structured on the basis of those measurements must be used to achieve the closest possible approximation of the actual pollution levels. The measurement must be coordinated with an accredited laboratory and the report regarding the measurement must be presented as documentation.
The TVOC concentration and the formaldehyde content in the indoor air are determined on the basis of the applicable standards (EN ISO 16000-5, ISO 16000-6, ISO 16000-3, US EPA TO-1 / TO-15, US EPA TO-17, US EPA TO-11A and methods described in the ASHRAE 189.1 standard). The TVOC value is assessed in accordance with the specifications of ISO 16000-6, Annex A, or in accordance with the Table 1 in US EPA standard method TO-1 / TO-15 / TO-17.
The comparative evaluation is carried out on the basis of measurements taken within four weeks after completion.

A building cannot be certified if it has a TVOC concentration exceeding 3000 µg/m³ or a formaldehyde content exceeding 100 µg/m³, (respective 500 µg/m³ if ASHRAE 189.1 standard list was used) or if the most recent version of guide value II or Regulatory and Advisory numbers have been exceeded.

A building will achieve the maximum evaluation points if the TVOC value is < 500 µg/m³ (respective 300 µg/m³ or 200 µg/m³ for a measurement referring to US EPA TO-1/15/17 or the ASHRAE 189.1 standard) and the formaldehyde value is < 30 µg/m³. The partial target value is achieved if the TVOC value is < 1000 µg/m³ and the formaldehyde value is < 60 µg/m³.
For evaluation of volatile organic compounds without a guide value I, the VOC guide values for new buildings determined as part of a research assignment of the German Federal Environment Agency must be used, see Annex 1. Measured values more than 50% higher than these comparison values indicate that the building studied features levels of indoor air VOC pollution that are higher than the background level to a statistically significant degree.

If significantly higher concentrations than would "normally" be expected occur for individual VOCs, this does not

result in the building being rejected, but does mean that the test report must indicate the source of the substance or include a declaration regarding the decay behaviour. If this information is not provided, the measurement will not be accepted.

Indicator 2: Indoor air quality – Air exchange rate

Office **Education** **Assembly buildings** **Hotel** all room types to be considered, e.g. for Hotels the office and guest rooms.

Multiple alternative evaluation methods are available for evaluating the ventilation rate. For mechanical ventilation using ventilation systems, the evaluation can be carried out in accordance with EN 15251 or via a zonal flow simulation or DIN EN 16798-1 (new standard). For natural ventilation through opening windows, documentation is possible via the workplace regulation or a zonal flow simulation.

The evaluation of the total ventilation rate for non-residential buildings must be carried out in accordance with the calculation specifications of EN 15251 (or DIN EN 16798-1), Annex B, Section "B.1.2 Method based on person and building component". The person component takes into account natural perspiration of users as well as CO_2 pollution due to breathing. The total ventilation rate q_{tot} (= air flow per person + air flow for the building component) defines the satisfaction rate of users in accordance with EN 15251.

$q_{tot} = n * q_P + A * q_B$ (n: Number of persons, A: Floor area)

Where:
q_{tot} is the total ventilation rate of the room, in l/s;
n is the design specification for the number of persons in the room, –;
q_P is the ventilation rate for the occupancy or use per person, l/s, per;
A is the floor area of the room, m^2;
q_B is the ventilation rate based on the building emissions, l/s, m^2.

The ventilation rates recommended in EN 15251 are based on complete mixing of the air in the room. If the air distribution does not equate to complete mixing, the required ventilation rates can be adjusted accordingly. The ventilation rates recommended in EN 15251 can be divided by the ventilation efficiency. The following flat-rate values can be applied for the ventilation efficiency:

- Ventilation efficiency for mixing ventilation = 1.0
- Ventilation efficiency for displacement ventilation = 1.3

If it is documented that the implemented ventilation outlets achieve a higher ventilation efficiency, that value can be applied instead.

For evaluation of the building component, the building is assigned to one of the following categories: Very low polluting, low polluting and not low polluting. This categorisation is carried out in accordance with Annex C of EN 15251.
The category of "very low polluting building" in accordance with EN 15251 can be applied for the DGNB documentation as an alternative to Annex C if the VOC emissions are restricted to the target value (50 points) for the VOC/formaldehyde indicator. The category of "low polluting building" can be achieved with an indoor air quality corresponding to the partial target value (25 points) for the indicator.

The category of "very low polluting building" in accordance with EN 15251 can be applied for the DGNB documentation as an alternative to Annex C if the requirements of quality level 4 in accordance with ENV1.2 are complied with and documented for all internal materials. The category of "low polluting building" can be achieved by complying with the requirements of quality level 3.

For natural ventilation, the evaluation of the ventilation rate is carried out in accordance with the specifications of workplace regulation A 3.6, Section 5. Natural ventilation can be implemented either as boost ventilation or as continuous ventilation.

The following values as a minimum must be plausibly presented for the review:

- Natural ventilation system.
- Description of the representative room, demonstrating that it can be applied to the other rooms.
- Compliance with the maximum permitted room depth with regard to clear room height in accordance with workplace regulation A 3.6 (Table 3.1.3).
- Calculation documenting the opening surfaces (see also the calculation examples in the appendix of workplace regulation A 3.6).

As an alternative, it is possible to document the ventilation rate via a zonal flow simulation, both for naturally ventilated and mechanically ventilated rooms. The flow simulations must be based on the same information as is required for the thermal simulations for documentation of SOC1.1, indicators 1 and 5, operative temperature. The aerodynamic surfaces of the window casements must be depicted for the natural ventilation simulation. For windows/doors that are opened manually, suitable boundary conditions for the user behaviour must be selected.

A simulation covering the entire year, demonstrating the progression of the CO_2 concentration over time, is required for documentation of the ventilation rate. The maximum permitted CO_2 concentration in excess of the exterior air concentration (see Table B.4 of EN 15251) must be complied with for ≥ 95% of the use time.

The boundary conditions of the zonal flow simulation must be clearly documented, e.g. occupancy scenarios, CO_2 emissions from users, ventilation elements and cross-sections, ventilation behaviour. In addition, the aerodynamic parameters for the ventilation openings used in the simulations must be also specified.

Residential

The indoor air in an apartment is contaminated more or less heavily by the breathing of residents, the development of water vapour in the bathroom or kitchen (moisture and CO_2), the emissions from the facilities (VOCs) and other discharges. In order to ensure hygienic air quality in the apartment, the air present in the room must be exchanged in sufficient quantities. The number of residents, possible emissions from construction materials and items of equipment and the activities in the rooms must be taken into account here. The German DIN 1946 Part 6 defines protection against excessive moisture and measures to ensure indoor air hygiene. The evaluation of the air exchange rate achieved in the building is carried out on the basis of the categorisation in DIN 1946 Part 6.

Air exchange rate
Ventilation concept in accordance with DIN 1946 Part 6: In accordance with DIN 1946 Part 6, four different minimum values are defined for the total exterior volume flows (values including building infiltration).

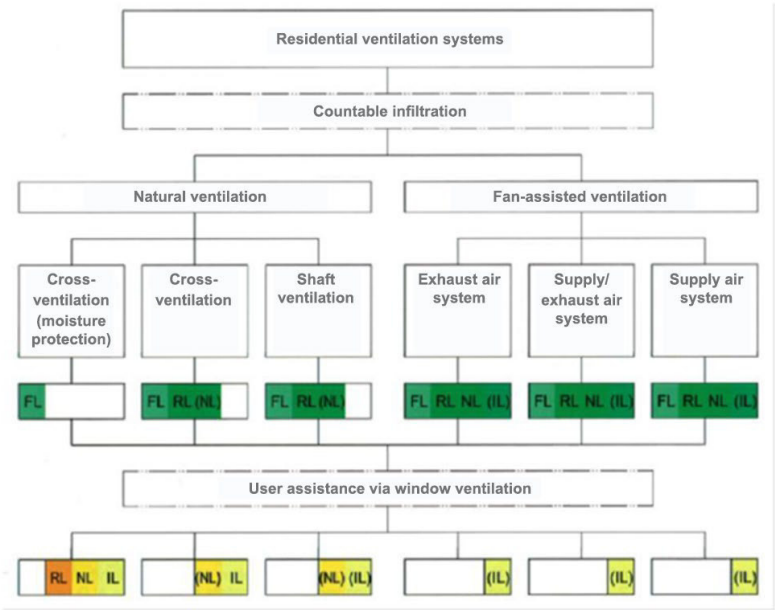
Ventilation for moisture protection:

User-independent ventilation (minimum operation) intended to prevent mould and moisture damage in the building depending on the thermal insulation level of the building (0.3 x nominal ventilation for high thermal insulation; 0.4 x Nominal ventilation for low thermal insulation) under normal use conditions (partially reduced moisture loads; room temperatures).

Reduced ventilation:
Usage-independent ventilation (0.7 x nominal ventilation) that meets the minimum requirements for indoor air quality under normal usage conditions with temporary absence (moisture and pollutant loads).

Nominal ventilation:
Ventilation required (1.0 x nominal ventilation) to ensure building protection as well as the hygiene and health requirements for planned use (normal operation). This level is the basis for the design of mechanical ventilation.

If the ventilation air volume required for moisture protection is not achieved by means of user-independent ventilation via building infiltration, one of the following ventilation measures as defined by DIN 1946-6 is required:



Design in accordance with values given in brackets is recommended.
Tables 5 and 6 in DIN 1946 Part 6 can be used as an indicator for the values of individual total exterior flow rates. The total extracted air flow rates are defined in accordance with Table 7 of DIN 1946 Part 6 or the requirements of the German DIN 18017 Part 3.

The different systems of the residential ventilation have different properties with regard to planning reliability, energy efficiency and usage comfort. The influencing factor of the user only plays a secondary role.

Shopping centre **Department stores**

In accordance with EN 15251 (or DIN EN 16798-1), the ventilation rates for non-residential buildings are designed on the basis of the building and person component.
The evaluation of the total ventilation rate for non-residential buildings must be carried out in accordance with the calculation specifications of EN 15251 (or DIN EN 16798-1), Annex B "Basis for the criteria for indoor air quality and ventilation rates". Here, the person component takes into account natural perspiration of users as well as CO2 pollution due to breathing. The total ventilation rate q_{tot} (= air flow per person + air flow for the building component) defines the satisfaction rate of users in accordance with EN 15251.

$\mathbf{q_{tot} = n * q_P + A * q_B}$ (n: Number of persons, A: Floor area)

Where
q_{tot} is the total ventilation rate of the room, in l/s;
n is the design specification for the number of persons in the room, –;
q_P is the ventilation rate for the occupancy or use per person, l/s, per;
A is the floor area of the room, m^2;
q_B is the ventilation rate based on the building emissions, l/s, m^2.

The ventilation rates recommended in EN 15251 are based on complete mixing of the air in the room. If the air distribution does not equate to complete mixing, the required

ventilation rates can be adjusted accordingly. The ventilation rates recommended in EN 15251 can be divided by the ventilation efficiency. The following flat-rate values must be applied for the ventilation efficiency:

- Ventilation efficiency for mixing ventilation = 1.0
- Ventilation efficiency for displacement ventilation = 1.3

If it is documented that the implemented ventilation outlets achieve a higher ventilation efficiency, that value can be applied instead.
The evaluation of the ventilation rate due to persons must be carried out within Categories I to III in accordance with the table "Examples of recommended ventilation rates" (EN 15251:2012 Annex B, Table B3). The same applies to the applicable building component, i.e. contamination due to the building itself.
The total ventilation rate and thus the ventilation rate due to persons must be documented with the NSC15_SOC1.2_Tool.

General specifications for rental spaces and mall spaces:
Evaluation of the rental and mall spaces takes place separately. The following basic principles apply to both areas here:

EN 15251 contains recommendations for the occupancy rate of department stores (7 m² per person), but it is possible to deviate from these recommendations in justified cases. Studies of various building types have shown that this occupancy rate is generally not achieved in reality. For this reason, one of the following methods can be applied for determining the occupancy rate for the purposes of the DGNB certification:

- Reliable project-specific predictions are applied (the following are required: Daily number of customers, average length of stay, opening times)
- Assignment to one of the specified typical profiles (discount store, full-range supplier, DIY store); the

auditor recommends the assignment to the DGNB and plausibly justifies this assignment. The assignment must be confirmed by the DGNB.

- If no information is available: Application of the conservative value of 7 m² per person in accordance with EN 15251, Table B.2

The NSC15_SOC1.2_Tool must be used for cases 1 and 2. The daily number of customers, average length of stay and opening times are entered into this tool. In addition, a safety margin of 100% is applied to the average length of stay by the tool in order to take peak times into account. This process calculates the number of persons applicable for the evaluation, taking into account the parameters mentioned above.

In addition, in all cases (1 to 3), categorisation as a "very low polluting", "low polluting" or "polluting" building must be carried out in order to enable the building components to be taken into account on a project-specific basis; this categorisation is fundamentally carried out in accordance with EN 15251, Annex C.

For the DGNB documentation, a "very low polluting" or "low polluting" building can be categorised on the basis of criterion ENV1.2 as an alternative. Quality level 4 as defined in criterion ENV1.2 corresponds to a very low polluting building, quality level 3 corresponds to a low polluting building and quality levels 1 and 2 correspond to a non-low polluting building.

It is assumed that a reasonable selection of construction materials is taken into account as part of the project planning. In addition, it must be ensured that the indoor air quality is not adversely affected by using construction materials that are not taken into account in ENV1.2. If a rental space has no documentation proving that emissions from construction materials are restricted (cf. indicator 1), that area must be categorised as "not low polluting".

Overflow from rental spaces:
If the building concept provides for air overflowing from the shop or rental spaces into the mall and contributing to ensuring hygienic air exchange there, this may also be applied for the evaluation. In order to do so, the relevant data (air flow rate, customers, etc.) for all shops is entered into the tool. Taking into account the intended ventilation quality (Category I to IV) in the shops, the tool automatically calculates how much "fresh" air is still available and makes this amount available to the mall (see "Fresh air share", "Mall overflow“). This overflow must be plausibly documented, and (partial) extraction of the used air in the rental spaces must be taken into account accordingly (e.g.: If 100,000 m³/h of supply air is introduced into the rental spaces and 70,000 m³/h of this is extracted into the mall and the rest is extracted into the shops, a value of "70%" must be entered into the tool).

Logistics **Production**

The evaluation of the ventilation is carried out in accordance with workplace regulation A 3.6.

For mechanical ventilation, the exterior air flow must be designed to ensure that loads (substances, moisture loads, thermal loads) are reliably removed and that the CO_2 concentration does not exceed 1000 ppm.

For natural ventilation, it must be documented that the requirements of workplace regulation A 3.6 have been met (e.g. compliance with the maximum room depths in accordance with Table 3 of the workplace regulation). The opening surfaces must be dimensioned such that they meet the requirements for either continuous ventilation or boost ventilation.

Alternatively, in the case of natural ventilation, it is also permitted to prove via a zonal building simulation that the

loads are removed and the CO_2 concentration does not exceed 1000 ppm.

For both natural and mechanical ventilation, it must be ensured that the exterior air is not contaminated to an impermissible degree and is not noticeably adversely affected, e.g. by outgoing air from extraction or indoor air ventilation systems, by heavy traffic or by poorly ventilated locations.

If the indoor air quality in work areas is adversely affected by additional loads (e.g. substances, moisture loads or thermal loads), it must be documented that suitable measures are in place to ensure sufficient air quality is achieved as per workplace regulation A 3.6.

If tasks are carried out at the workstation involving hazardous substances or biological agents that could thereby endanger employees, the provisions in accordance with the German Ordinance on Hazardous Substances or the German Biological Agents Ordinance, including the corresponding technical rules, apply with regard to the dangers resulting from substances at these workstations.

The appropriate level of ventilation can be achieved via the following measures, for example:

- A concept for natural ventilation is created. At minimum, the ventilation surfaces required for continuous ventilation in accordance with workplace regulation A 3.6 are motorised and operated automatically via sensors (e.g. CO_2 sensors).
- The fresh air flow rate of the mechanical ventilation can be adjusted to suit current requirements either by the user (e.g. step switch) or automatically via sensors (e.g. CO_2 sensors).

Over-fulfilment of the hygienically required minimum air exchange by at least 20% must be documented in the following way: First, the substance loads resulting from emissions due to persons, the building and industrial processes must be determined. These must be used as a basis for determining the required air quantities or natural ventilation cross-sections. For documentation of the target value, these values must be increased by 20% across at least 95% of workstations.

Natural ventilation through opening windows

The requirements of workplace regulation A

System	Maximum permissible room depth in relation to the clear room height (h) [m]	Opening surface to ensure minimum air exchange	
		for continuous ventilation [m^2/present person]	for shock ventilation [m^2/10 m^2 floor area]
I one-sided ventilation*	Room depth = 2.5 x h (at h > 4 m: max. depth of space = 10 m) (assumed air speed in cross-section = 0.08 m/s)	0,35	1,05
II Cross ventilation*	Room depth = 5.0 x h (at h > 4 m: max. depth of space = 20 m) (assumed air speed in cross-section = 0.14 m/s)	0,20	0,60

System I: Single sided ventilation through external wall. System II: Transverse ventilation from external wall to wall or from external wall to roof.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The allocation of points for individual indicators must be backed up by comprehensive and plausible evidence.

Indicator 1: Indoor air quality – Volatile organic compounds (VOCs)

- Determination of levels of volatile to semi-volatile organic compounds and formaldehyde
- Confirmation of rooms selected for measurement and time of measurement (template for the confirmation can be found in Annex 1)
- Share of total number of rooms for individual furnishing types
- Accreditation of the institute conducting measurement (analytical laboratory/measuring institute), including details of name, business address, legal entity and a copy of the accreditation certificate

Indicator 1.2: AGENDA 2030 BONUS – Reduction in pollutant emissions in the indoor air, health and well-being

- Floor plans/site plans
- Photos
- Explanation of the implemented measures

Indicator 2: Indoor air quality – Air exchange rate

- Assessment of the air exchange rate due to persons in accordance with EN 15251 / DIN EN 16798-1
- Documentation in accordance with the workplace regulation
- Completion of a zonal flow simulation

ANNEX 1

Template for verification

Confirmation of rooms selected for measurement and time of measurement (VOC):

Confirmation by the auditor or commissioned expert that the indoor air VOC measurements have been carried out in accordance with the requirements listed in the criterion.

We, _____, hereby confirm
for the project:
_____
in the scheme: _____
that the interior furnishings of the rooms selected for the indoor air measurement correspond to the main furnishing types found in the building, and that the rooms are therefore a representative sample for determining possible pollution of the indoor air by the installed construction materials and construction products.
The measured rooms have been selected on the basis of Table 1 in the criterion. Measurements have been carried out on all furnishing types with a share of more than 10% of all rooms in the building.

We confirm that the sample collection was carried out within four weeks following completion of the rooms to be sampled in each case.

_____

Date Signature of the auditor or appointed expert Stamp

Guidelines for commissioning and implementation of the indoor air measurements, required documentation:

1 The relevant interior surfaces for specifying the furnishing types in the rooms

- Floor covering type with details of system structure (above top edge of unfinished floor)
- Wall coverings, where relevant panelling, partition wall systems, etc.
- Ceiling surfaces, e.g. acoustic ceiling, with type of coatings
- Ceiling sails
- Door types (timber, plastic, metal, lacquer surfaces, etc.)
- indoor surfaces of windows (lacquer, metal, plastic, etc.)

2 Measuring conditions/measuring apparatus:

- Room conditioning before and during sampling in accordance with EN ISO 16000-5 or ASHRAE 189.1
- Submission of ventilation reports, e.g. in accordance with the template in EN ISO 16000-1 Annex D Guidelines for information to be recorded during indoor air measurement
- Sampling for formaldehyde with DNPH cartridge, ISO 16000-3, or US EPA TO-11A
- Sampling for TVOCs with Tenax TA tubes, ISO 16000-6, US EPA TO-1, or Sampling onto Sorbent Tubes US EPA TO-17, or Canister samplers US EPA TO-15.
- Please note: Sampling is carried out in coordination with the laboratory, and there are no special requirements for the sampler – except for the declarations mentioned above.

3 Institute conducting measurement (analytical laboratory/measuring institute):

- Accreditation documentation of the institute conducting measurement, including details of name, business address, legal entity and a copy of the accreditation certificate for the relevant standards and methods.

4 Laboratory report/measurement report:

- Determination of VOCs in accordance with:
  ISO 16000-3 / US EPA TO-11A / ASTM Standard Method D 5197 = Requirements for formaldehyde analysis
  ISO 16000-6 / US EPA TO-1 / 15 / 17= Requirements for TVOC analysis
- Individual VOC values (quantification of all substances in the New Construction Benchmarks list in Annex 2 or Annex 3)
- Comparison of individual values with Guidelines 2, Regulatory and Advisory numbers and New Construction Benchmarks in a suitable table format
- Specification of TVOCs and formaldehyde

5 Evaluation of the measurement results:

- Summary report/expert report
- Statement regarding source or decay behaviour if New Construction Benchmarks, Heals numbers and Guidelines 1 are exceeded
- Evaluation of the measurement results in accordance with criterion (the worst value is used for the evaluation. The use of intermediate values is not possible).

6 Persons responsible for reporting:
The areas of responsibility can vary from project to project; one possible distribution is:

- Explanation of the criterion: Auditor

- Confirmation and specification of the furnishing types in the rooms: Auditor/expert
- Points 2 and 5: Expert
- Points 3 and 4: Analytical laboratory

ANNEX 2*

New Construction Benchmarks for evaluation of individual substances as part of VOC measurements

CAS NO.	SUBSTANCE NAME	NEW CONSTRUCTION BENCHMARKS [µg/m³]	GUIDELINES 1 [µg/m³]	GUIDELINES 2 [µg/m³]
57-55-6	propane-1,2-diol	95		
107-98-2	1,2-Propylene glycol monomethyl ether, 1-methoxy-2-propanol		1000	10,000
1569-02-4	2-Propylene glycol-1-ethyl ether		300	3000
57018-52-7	2-Propylene glycol-1-tert-butyl ether		300	3000
	Default value: Glycol ether with insufficient data available		0.005 ml/m³ (v) (=0.05 ppm)	0.05 ml/m³ (v) (=0.005 ppm)
71-36-3	1-Butanol		700	2000
872-50-4	1-Methyl-2-pyrrolidone		100	1000
96-29-7	Butanone oxime		20	60
104-76-7	2-Ethylhexanol		100	1000
112-25-4	2-Hexoxyethanol		100	1000
57018-52-7	2-Propylene glycol-1-tert-butyl ether (2PG1tBE)		300	3000
75-07-0	Acetaldehyde		100	1000
Group	Aldehydes, C4 to C11 (saturated, acyclic, aliphatic)		100	1000
Group	Alkylbenzenes, C9–C15		100	1000

CAS NO.	SUBSTANCE NAME	NEW CONSTRUCTION BENCHMARKS [µg/m³]	GUIDELINES 1 [µg/m³]	GUIDELINES 2 [µg/m³]
80-56-8	alpha-Pinene (bicylic terpene)	200		
100-52-7	Benzaldehyde		20	200
100-51-6	Benzyl alcohol		400	4000
123-72-8	Butanal	70		
Group	C9–C14-Alkanes/isoalkanes (low aromatics content)		200	2000
75-09-2	Dichloromethane		200	2000
111-96-6	Diethylene glycol dimethyl ether		30	300
111-77-3	Diethylene glycol methyl ether		2000	6000
112-34-5	Diethylene glycol monobutyl ether		400	1000
111-90-0	Diethylene glycol monoethyl ether, ethyldiglycol		700	2000
84-66-2	Diethyl phthalate	5		
34590-94-8	Dipropylene glycol monomethyl ether		2000	7000
105-60-2	Epsilon-Caprolactam	5		
64-19-7	Acetic acid	116		
141-78-6	Ethyl acetate		600	6000
100-41-4	Ethyl benzene		200	2000
111-76-2	Ethylene glycol monobutyl ether		100	1000

CAS-NO.	SUBSTANCE NAME	NEW CONSTRUCTION BENCHMARKS [µg/m³]	GUIDELINES 1 [µg/m³]	GUIDELINES 2 [µg/m³]
112-25-4	Ethylene glycol hexyl ether		100	1000
112-07-2	Ethylene glycol monobutyl ether acetate		200	2000
110-80-5	Ethylene glycol monoethyl ether, 2-Ethoxyethanol		100	1000
111-15-9	Ethylene glycol monoethyl ether acetate		200	2000
109-86-4	Ethylene glycol monomethyl ether, 2-Methoxyethanol		20	200
122-99-6	Ethylene glycol monophenyl ether (EGMP, 2-Phenoxyethanol)		30	300
98-01-1	Furfural		10	100
Group	Cresols		5	50
138-86-3	Limonene	1000		
78-93-3	Methyl ethyl ketone, ethyl methyl ketone	290		
108-10-1	Methyl isobutyl ketone		100	1000
Group	Monocyclic monoterpenes (lead substance d-Limonene)		1000	10,000
Group	Naphthalene and compounds similar to naphthalene		10	30
123-86-4	n-Butyl acetate	60		
124-19-6	Nonanal	10		

CA- NO.	SUBSTANCE NAME	NEW CONSTRUC-TION BENCHMARKS [µg/m³]	GUIDELINES 1 [µg/m³]	GUIDELINES 2 [µg/m³]
124-07-2	Octanoic acid	20		
108-95-2	Phenol		20	200
1569-02-4	Propylene glycol monoethyl ether		300	3000
100-42-5	Styrene		30	300
Group	Terpenes, bicyclic (lead substance ?-Pinene)		200	2000
127-18-4	Tetrachloroethene	5		
108-88-3	Toluene		300	3000
Group	Cyclic dimethylsiloxane D3-D6 (total guide value)		400	4000
94-47-6; 108-38-3; 106-42-3; 1330-20-7	Total xylenes		100	800
75-29-6	2-Chloropropane		800	8000

Information regarding documentation of New Construction Benchmarks (Annex 2) incl. Guidelines 1: All listed compounds and groups are detectable with a sufficient level of certainty using the assigned analysis method using Tenax TA tubes in accordance with ISO 16000-6. There are other documentation processes available for a portion of the compounds that enable a higher level of detection certainty, but the limits of determination that can be achieved with Tenax are below the applicable New Construction Benchmarks/Guideline 1 with a sufficiently safe margin.

* Annex 2 is regularly updated in accordance with newly derived guidelines published by the German Committee on Indoor Guide Values.

ANNEX 3**

Reference concentrations (RfC) and regulatory numbers for evaluation of individual substances as part of VOC measurements:

CAS NO.	SUBSTANCE NAME	ASHRAE 189.1 BENCHMARKS [µg/m³]	HEALTH NUMBERS[4] (NON-CANCER) [µg/m³]	REGULATORY AND ADVISORY NUMBERS[5] [µg/m³]
79-34-5	1,1,2,2-Tetrachloroethane; C2H2C14		3000	3.500
79-00-5	1,1,2-Trichloroethane; C2H3C13		400	4.500
57-14-7	1,1-Dimethylhydrazine; C2H8N2		1	15
120-82-1	1,2,4-Trichlorobenzene; C6H3C13		200	4.000
96-12-8	1,2-Dibromo-3-chloropropane; C3H5Br2C1		1	10
106-88-7	1,2-Epoxybutane (1,2-butylene oxide); C4H8O		20	590
75-55-8	1,2-Propyleneimine (2-methylazindine); C3H7N		46	460
542-75-6	1,3-Dichloropropene; C3H4C12 (cis)		20	1.000
106-46-7	1,4-Dichlorobenzene (p-); C6H4Cl2	800	800	6.000
123-91-1	1,4-Dioxane (1,4 Diethylene oxide); C4H8O2	3000	30	3.600
540-84-1	2,2,4-Trimethyl pentane; C8H18		350	35.000
79-46-9	2-Nitropropane; C3H7NO2		20	9.000

[4] Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA (Environmental Protection Agency US).

[5] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are non-regulatory values provided by the Government or other groups as advice.

75-05-8	Acetonitrile (cyanomethane); C2H3N		60	7.000
98-86-2	Acetophenone; C8H8O		490	3.200
107-02-8	Acrolein (2-propenal); C3H4O		1	25
79-06-1	Acrylamide; C3H5NO		1	30
79-10-7	Acrylic acid; C3H4O2		1	300
107-13-1	Acrylonitrile (2-propenenitrile); C3H3N	5	5	430
62-53-3	Aniline (aminobenzene); C6H7N		1	1.900
71-43-2	Benzene; C6H6	60	30	320
100-44-7	Benzyl chloride (a-chlorotoluene); C7H7C1		22	220
57-57-8	Beta-Propiolactone; C3H4O2		15	150
542-88-1	Bis(chloromethyl) ether; C2H4C12O		0.5	3
75-25-2	Bromoform (tribromomethane); CHBr3		50	500
56-23-5	Carbon tetrachloride; CC14	40	40	1.200
120-80-9	Catechol (o-hydroxyphenol); C6H6O2		200	2.000
79-11-8	Chloroacetic acid; C2H3C1O2		42	190
108-90-7	Chlorobenzene; C6H5C1	1000	1000	8.000
67-66-3	Chloroform; CHC13	300	150	300
126-99-8	Chloroprene (2-chloro-1,3-butadiene); C4H5C1		20	400

CAS NO.	SUBSTANCE NAME	ASHRAE 189.1 BENCHMARKS [µg/m³]	HEALTH NUMBERS[6] (NON-CANCER) [µg/m³]	REGULATORY AND ADVISORY NUMBERS[7] [µg/m³]
1319-77-3 , 95-48-7, 108-39-4, 106-44-5	Cresylic acid (cresol isomer mixture); C7H8O		4	50
98-82-8	Cumene (isopropylbenzene); C9H12		400	4.000
111-44-4	Dichloroethyl ether (BIS(2-Chloroethyl)Ether); C4H8C12O		100	300
77-78-1	Dimethyl sulfate; C2H6O4S		5	50
79-44-7	Dimethylcarbamyl chloride; C3H6C1NO		2	7
106-89-8	Epichlorohydrin (l-chloro-2,3-epoxy propane); C3H5C1O	3	3	1.000
140-88-5	Ethyl acrylate; C5H8O2		5	2.000
100-41-4	Ethylbenzene; C8H10	2000	2000	10.000
106-93-4	Ethylene dibromide (1,2-dibromoethane); C2H4Br2		1	30
107-06-2	Ethylene dichloride (1,2-dichloroethane); C2H4C12		400	2.000
107-21-1	Ethylene glycol C2H6O2	400	400	10.000
75-34-3	Ethylidene dichloride (1,1-dichloroethane); C2H4C12		500	5.000
50-00-0	Formaldehyde; CH2O	33[8]	9	100
87-68-3	Hexachlorobutadiene; C4C16		90	240

[6] Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA (Environmental Protection Agency US).

[7] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are non-regulatory values provided by the Government or other groups as advice.

[8] If the US EPA TO-11A method will be used for a measurement, then the threshold for Formaldehyde can be set at 100 µg/m³

CAS NO.	SUBSTANCE NAME	ASHRAE 189.1 BENCHMARKS [µg/m³]	HEALTH NUMBERS[9] (NON-CANCER) [µg/m³]	REGULATORY AND ADVISORY NUMBERS[10] [µg/m³]
67-72-1	Hexachloroethane; C2C16		80	1.000
110-54-3	Hexane; C6H14	7000	200	18.000
78-59-1	Isophorone; C9H14O	2000	12	11.000
67-63-0	Isopropanol C3H8O	7000	320	2.450
67-56-1	Methanol; CH4O		4000	10.000
71-55-6	Methyl chloroform (1,1,1 trichloroethane); C2H3C13	1000	1000	6.800
78-93-3	Methyl ethyl ketone (2-butanone); C4H8O		1000	5.900
108-10-1	Methyl isobutyl ketone (hexone); C6H12O		80	2.000
80-62-6	Methyl methacrylate; C5H8O2		320	2.040
1634-04-4	Methyl tert-butyl ether; C5H12O	8000	3000	14.500
60-34-4	Methylhydrazine; CH6N2		2	20
108-38-3	m-Xylene; C8H10		240	2.600
91-20-3	Naphthalene	9	9	5.000
121-69-7	N,N-Dimethylaniline; C8H11N		25	2.500
68-12-2	N,N-Dimethylformamide; C3H7NO	80	30	3.000

[9] Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA (Environmental Protection Agency US).

[10] Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are non-regulatory values provided by the Government or other groups as advice.

98-95-3	Nitrobenzene; C6H5NO2		2	500
95-48-7	o-Cresol(2-Methylphenol); C7H8O		100	2.200
95-47-6	o-Xylene; C8H10		80	900
108-95-2	Phenol; C6H6O	200	6	1.900
78-87-5	Propylene dichloride (1,2-dichloropropane); C3H6C12		4	3.500
107-98-2	Propylene glycol monomethyl ether	7000	2000	20.000
106-42-3	p-Xylene; C8H10		80	900
96-09-3	Styrene oxide; C8H8O		6	1.900
100-42-5	Styrene; C8H8	900	1000	8.500
127-18-4	Tetrachloroethylene (Perchloroethylene); C2C14	35	40	1.700
108-88-3	Toluene; C7H8	300	5000	7.500
79-01-6	Trichloethylene; C2HC13	600	500	6.000
121-44-8	Triethylamine; C6H15N		7	1.900
108-05-4	Vinyl acetate; C4H6O2	200	200	1.500
1330-20-7,95-47-6, 108-38-3, 106-42-3	Xylenes (isomer & mixtures); C8H10	700	400	4.350

** This list of 72 compounds for TO-1/15/17 measurement standards, more closely matches with the EPA 8260 target list, but this list can be extended to 100 compounds. In some cases (for some regions or countries) where availability of the relevant laboratory equipment is restricted, measured compounds list can be shortened. In this case, information about the measurement procedures and technical aspects must be communicated and agreed with DGNB in the system adaptation phase.

Description “Health numbers”:
Vast majority of Health numbers are referring to the US EPA Reference Concentrations (RfC) and California Environmental Protection Agency (CalEPA) reference exposure levels.
The reference concentration or RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Generally used in EPA's noncancer health assessments.
The California Environmental Protection Agency (CalEPA) has established a chronic reference exposure level. The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to occur.

Description “Regulatory and advisory numbers”:
Regulatory numbers are referring to OSHA PEL (Occupational Safety and Health Administration's permissible exposure limit) expressed as a time weighted average - the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.
Majority of advisory numbers are referring to ACGIH TLV (American Conference of Governmental and Industrial Hygienists' threshold limit value) expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects and to NIOSH REL (National Institute of Occupational Safety and Health's recommended exposure limit) exposure limit for an 8- or 10-h time-weighted-average exposure.
(All “Regulatory and advisory numbers” have been corrected in compliance with to odour thresholds, chronic exposure levels and NOAEL- non observed adverse effect levels).

Appendix C – Literature

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
all	General, Evaluation and Usage-specific description: scheme “Assembly buildings” has been added	16.09.2021
all	Evaluation, method and documentation: alternative norm/standard has been introduced DIN EN 16798-1	16.09.2021
358	Usage-specific description: measurement unit change, instead of 10% of rooms now 10% NFA to be measured, amendment in the Table 1	16.09.2021

II. Literature

- EN 15242. Ventilation for buildings – Calculation methods for the determination of air flow rates in buildings including infiltration. Berlin: Beuth publisher. September 2007
- EN 15251: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics. Berlin: Beuth publisher. August 2007
- DIN EN 12599. Ventilation for buildings – Test procedures and measurement methods
- to hand over air conditioning and ventilation systems. Berlin: Beuth publisher. January 2011
- ISO 16000-1. Indoor air – Part 1: General aspects of sampling strategy. Berlin: Beuth publisher. June 2006

- ISO 16000-3: Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds; active sampling method. Berlin: Beuth publisher. March 2003
- EN ISO 16000-5: Indoor air – Part 5: Sampling strategy for volatile organic compounds (VOCs). Berlin: Beuth publisher. May 2007
- ISO 16000-6: Indoor air – Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on TENAX TA® sorbent, thermal desorption and gas chromatography using MS or MS-FID. Berlin: Beuth publisher. December 2004
- EN ISO 16000-9: Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method. Berlin: Beuth publisher. April 2008
- EN ISO 16000-11: Indoor air – Part 11: Determination of the emission of volatile organic compounds from building products and furnishing – Sampling, storage of samples and preparation of test specimens. Berlin: Beuth publisher. June 2006
- Sustainable Development Goals icons, United Nations/globalgoals.org
- Level(s) – Common EU framework of core environmental indicators - http://publications.jrc.ec.europa.eu/repository/bitstream/JRC109285/jrc109285_171205_levels_eu_framework_of_building_indicators_parts_1_and_2_pubsy_version_b1.0.pdf
- ANSI/ASHRAE/USGBC/IES Standard 189.1-2014 - Standard for the Design of High-Performance Green Buildings, ASHRAE and U.S. Green Building Council, 2014.
- EPA/625/R-96/010b - Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters and Analysed By Gas Chromatography Mass Spectrometry (GC/MS), Centre for Environmental Research Information, U.S. Environmental Protection Agency, 1999
- EPA/625/R-96/010b - Compendium Method TO-1, Method for the Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Tenax® Adsorption and Gas Chromatography/Mass Spectrometry (GC/MS), Centre for Environmental Research Information, U.S. Environmental Protection Agency, 1999
- EPA/625/R-96/010b - Compendium Method TO-17, Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes, Centre for Environmental Research Information, U.S. Environmental Protection Agency, 1999
- Volatile Organic Compounds (VOC) Criteria for New Construction - White Paper, approved by AIHA (American Industrial Hygiene Association) Construction and Toxicology Committees, 2017
- Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profiles for VOCs (Update). Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1998
- California Environmental Protection Agency (CalEPA). Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels. Draft for Public Comment. Office of Environmental Health Hazard Assessment, Berkeley, CA. 1997.
- Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Standards, Toxicant Hazardous Substances. Code of Federal Regulations. 29 CFR 1910.1000. 1998
- American Conference of Governmental Industrial Hygienists (ACGIH). 1999 TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents. Biological Exposure Indices. Cincinnati, OH. 1999.
- National Institute for Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 1997.
- U.S. Environmental Protection Agency. Integrated Risk Information System (IRIS). National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999The WHO European Centre for Environment and Health, Bonn Office, WHO guidelines for indoor air

quality selected pollutants, 2010.

- Standard Method for the Testing & Evaluation of VOC Emissions, Division of Environmental and Occupational Disease Control, California Department of Public Health 2010.
- OEHHA (the Office of Environmental Health Hazard Assessment) Acute, 8-hour and Chronic Reference Exposure Levels (chRELs), 2016.
- DIN EN 16798 – 1 Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, May - 2021.

SOC1.3

Acoustic comfort

Objective

The objective is to achieve room acoustic conditions that correspond to the intended use and to ensure appropriate user comfort.

Benefits

Good acoustic conditions are an important requirement for ensuring productivity and comfort of users.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)	CONTRIBUTION TO GERMAN SUSTAINABILITY STRATEGY
Moderate	3.4 Reduce mortality from non-communicable diseases and promote mental health	3.1.a/b Health and food

Outlook

There are currently no plans to make any of the requirements stricter.

Share of total score

	SHARE	WEIGHTING FACTOR
Office	**2.0%**	**2**
Education	**2.7%**	**3**
Hotel	**2.9%**	**3**
Residential **Consumer market**	**0.0%**	**0**
Shopping centre **Department stores**		
Logistics **Production**		
Assembly buildings	**3.1%**	**3**

EVALUATION

Room acoustics comfort is evaluated in accordance with the use of the rooms over the reverberation time, in order to achieve appropriate user comfort. In addition, an "Agenda 2030 Bonus" is awarded if all measures listed under indicators 1–5 have been implemented and verified via measurements. In this criterion, a total of 130 points can be achieved, but only a total of 100 points can be actually be awarded, or a maximum of 110 points including bonus.
Assembly buildings are divided into the different building types with regard to the assessment. These are under the chapter “IV. Usage-specific description" described.
Evaluation variants:
Two different variants are permitted for evaluation of this criterion. In both cases, at least 95% of the representative rooms must correspond to the evaluated quality level. For the scheme **Assembly buildings** is only variant 1 applicable.
Variant 1: Weighted evaluation on the basis of the actual ratios of usable area (NUF) (R) in accordance with DIN 277-1 (detailed Area descriptions under the document: “Evaluation and structure of the DGNB System”, chapter – Terms and Definitions, [T&D_04]); each of the indicators is weighted by percentage according to the area ratio for the associated use; the maximum possible number of evaluation points is based on the rooms that are actually available and under evaluation.
Variant 2: Simplified method without assignment of area ratios, in accordance with the points assigned for the indicators.

NO.	INDICATOR	POINTS
1	**Acoustic concept formulated during the planning process**	
1.1	**Room acoustics concepts**	
	Creation of a room acoustics concept plan which is updated during the planning process	
	Office **Education** **Hotel** **Assembly buildings** - Types I and III	**20**
	Assembly buildings – Type IV	**30**
	Assembly buildings – Type II	**40**
2	**Individual offices and multi-person offices up to 40 m²**	
2.1	**Compliance with the requirements for reverberation times**	
	Office	**Max. 20**
	ARITHMETIC MEAN OF THE REVERBERATION TIME ***T*** IN **S** IN EMPTY, UNFURNISHED STATE (OCTAVE BANDS 125 HZ TO 4000 HZ)	
	■ $1.0 < \overline{T} \leq 1.5$	10
	■ $0.8 < \overline{T} \leq 1.0$	15
	■ $\overline{T} \leq 0.8$	20
	Education **Hotel** **Assembly buildings** - Types I, III and IV	**Max. 10**
	ARITHMETIC MEAN OF THE REVERBERATION TIME $\overline{T}$ IN S IN AN EMPTY, UNFURNISHED STATE (MEAN VALUE OF REVERBERATION TIMES IN OCTAVE BANDS 125 TO 4000 HZ)	
	■ $1.0 < \overline{T} \leq 1.5$	5
	■ $0.8 < \overline{T} \leq 1.0$	7.5
	■ $\overline{T} \leq 0.8$	10

3 Multi-person offices larger than 40 m²

3.1 Compliance with the requirements for reverberation times

Office **Max. 30**

MEAN VALUE OF THE *A/V*-RATIO $\overline{A/V}$ IN M⁻¹ IN EMPTY, UNFURNISHED STATE (OCTAVE BANDS 125 HZ TO 4000 HZ)	ARITHMETICAL MEAN OF THE REVERBERATION TIME $\overline{T}$ IN S IN EMPTY, UNFURNISHED STATE (OCTAVE BANDS 125 TO 4000 HZ)	
$0.16 < \overline{A/V} \leq 0.2$	$0.8 < \overline{T} \leq 1.0$	15
≥ 0.2	≤ 0.8	30

Education **Hotel** **Assembly buildings** - Types I, III and IV **Max. 10**

MEAN VALUE OF THE *A/V*-RATIO $\overline{A/V}$ IN M⁻¹ IN EMPTY, UNFURNISHED STATE (OCTAVE BANDS 125 HZ TO 4000 HZ)	ARITHMETICAL MEAN OF THE REVERBERATION TIME $\overline{T}$ IN S IN EMPTY, UNFURNISHED STATE (OCTAVE BANDS 125 HZ TO 4000 HZ)	
$0.16 < \overline{A/V} \leq 0.2$	$0.8 < \overline{T} \leq 1.0$	5
≥ 0.2	≤ 0.8	10

Re 3 Possible additional points **+ Max. 10**

Taking into account sound absorption areas on the ceiling in open office structures or on the ceiling and the room dividers, in the case of floor-to-ceiling room dividers:

- 30% of the average equivalent sound absorption area on the ceiling and/or the floor-to-ceiling room dividers, as applicable — 5
- 70% of the average equivalent sound absorption area on the ceiling and/or the floor-to-ceiling room dividers, as applicable — 10

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4 Rooms in accordance with DIN 18041:2016-03 (room group A1–A5) with special requirements in terms of speech intelligibility (such as meeting rooms, seminar rooms or classrooms)

Office **Hotel** **Assembly buildings** - Types III and IV **Max. 20**

4.1 Compliance with the requirements for reverberation time T_{target}

- Compliance of all rooms with requirements in accordance with DIN 18041:2016-03 has been documented. See Appendix 1 — +10

Compliance with the requirements for inclusion

- Taking into account inclusive use in accordance with DIN 18041:2016-03 (teaching/communication inclusive, speech/lecture inclusive). See Appendix 1 — +10

Education **Assembly buildings** - Type I **Max. 30**

Compliance with the requirements for reverberation time T_{target}

- Compliance of all rooms with requirements in accordance with DIN — +15

18041:2016-03 has been documented. See Appendix 1

Compliance with the requirements for inclusion

- Taking into account inclusive use in accordance with DIN 18041:2016-03 (teaching/communication inclusive, speech/lecture inclusive). See Appendix 1 — +15

Assembly buildings – Type II — **Max. 50**

- Carrying out detailed acoustic simulations to evaluate room acoustic parameters for theatres and concert halls. For each room, clearly justified requirements for the mean reverberation time T, reverberation time and sound pressure level distribution, strength G, degree of clarity D and clarity C for typical occupancy conditions are to be worked out and assessed in each case. — 30
- Classification of the acoustician - Good acoustic conditions are to be expected. — +10
- Classification of the acoustician – Very good acoustic conditions are to be expected. — +20

Office **Education** **Hotel** **Assembly buildings** – Types I, III and IV

Re 3, 4, 5 **Possible additional points** — **+10**

Implementation of a detailed acoustic simulation of an open-plan office or for evaluation of other room acoustics parameters for open-plan offices and rooms in room group A ≥ 500 m³

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5 Rooms with recommendations in accordance with DIN 18041:2016-03 (building use B3–B5) with special requirements for noise reduction and/or room acoustics comfort (such as cafeterias, libraries or break rooms)

Note: **Assembly buildings**:
In the case of **Assembly buildings**, with type B2 rooms (such as exhibition rooms, traffic areas with high quality of occupancy, etc.) must be included into the consideration.

5.1 **Compliance with the recommendations for the A/V ratio in the frequency range 250–2000 Hz**

Office — **10**

Education **Assembly buildings** – Types I, II and IV — **30**

Hotel **Assembly buildings** – Type III — **40**

See Appendix 1

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6 AGENDA 2030 BONUS – STRESS REDUCTION, HEALTH AND WELL-BEING — +10

6.1 The objective of the AGENDA 2030 BONUS is to reduce premature death and promote good health and well-being.
Noise reduction: Indicators 2–5 achieve at least the reference value, have been implemented and have been confirmed via measurements. On this basis, it is possible to achieve a high level of acoustic quality in the building and a high level of acoustic comfort for building users. This minimises noise as a harmful factor and supports sustained, long-term user performance.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Information regarding reverberation times and the sound absorption area can be used as key performance indicators (KPI) for the communication.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Evaluation in accordance with room acoustics classes	[s]
KPI 2	Average value of the reverberation times (differentiated for different rooms)	[s]
KPI 3	Average equivalent sound absorption area	[%]

Synergies with DGNB system applications

- **DGNB OPERATION:** Achieving high levels of quality in this criterion provides great potential for achieving high satisfaction rates during ongoing operation for criterion 9.1 of the Buildings in use (BIU) scheme (user satisfaction).
- **DGNB RENOVATED BUILDINGS:** Large similarities with criterion SOC1.3 in the REN scheme.
- **DGNB INTERIORS:** Large similarities with criterion SOC1.3 in the NIR scheme.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Depending on the size and usage of a room, different measures may be necessary to achieve good acoustic conditions. In rooms designed for spoken communication, the focus is on a good level of speech intelligibility between the positions of the speakers and the positions of the listeners. In call centres and in dining rooms, achieving a low background noise level and good speech intelligibility over short distances is prioritised. In music rooms, promoting the music experience throughout the room takes priority. Compliance with the different requirements described in the DGNB criterion is required in order to achieve good room acoustic conditions in accordance with the use of the rooms.

II. Additional explanation

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III. Method

Acoustic comfort is evaluated via several individual indicators on the basis of the different room types. The basis of the evaluation is the specifications of DIN 18041:2016-03 "Acoustic quality in rooms", alternatively the local standard may be used.
If a detailed acoustic simulation is carried out, additional points can be achieved in the criterion.
When evaluating the acoustic comfort, the rooms specified in the indicators are relevant for the analysis (DIN 18041:2016-03: Rooms in group A and B, Individual offices and multi-person offices in accordance with room acoustics classes A, B and C. Any other permitted alternative verification options are listed in the relevant indicators.

Indicator 1: Acoustic concept formulated during the planning process
Indicator 1.1: Creation of a room acoustics concept that is updated during the planning process
Rooms have different acoustics requirements depending on their use. Careful planning is required to ensure good yet cost-effective, use-specific room acoustics. The objective is therefore to create an acoustic concept as early as possible during the planning process (room acoustics concept in accordance with German Fee Structure for Architects and Engineers (HOAI)). The concept takes into account both architectural planning and interaction with other construction tasks. The concept contains room groups A and B in accordance with DIN 18041:2016-03. This prevents the need to make subsequent, and generally cost-intensive, improvements to the room acoustics.

Indicator 2: Individual offices and multi-person offices up to an area of 40 m²
In particular, this indicator takes office rooms and multi-person offices up to an area of 40 m² into account. The recommendations for sound protection and acoustical design in offices must be complied with and documented for room acoustics classes A, B or C. Noise damping measures in individual offices can be assessed on the basis of the reverberation time. The reverberation time in furnished rooms when in use is extremely dependent on the distribution of sound-absorbing surfaces within the room, the furnishings and the number and type of objects used. This indicator therefore evaluates whether basic noise damping of the room has been ensured via the sound absorption of the room division surfaces installed on site.
The classification refers to offices that have been constructed and are ready for occupancy but are not occupied. Alternatively, verification for completed projects can be carried out via measurements in accordance with the standard method of DIN EN ISO 3382-2 in an unoccupied empty or furnished state.

Indicator 3: Multi-person offices with an area of more than 40 m²
In particular, this indicator takes multi-person offices with an area of more than 40 m² into account.
The recommendations for sound protection and acoustical design in offices must be complied with and documented for room acoustics classes A, B and C with regard to the reverberation time. The additional parameters used in these guidelines refer exclusively to the acoustic conditions of the room in conjunction with the furniture. If no information regarding the tenant fit out is available, the tenant fit out can only be treated as without absorbing furnishings.
Multi-person offices must be assessed over the reverberation time. Simply assessing the room acoustics conditions on the basis of the room damping is not considered to be meaningful. In the case of large multi-person offices, the A-weighted sound pressure level of speech at a distance of 4 m $L_{p,A,S,4m}$ in dB and the decay rate of speech in the room $D_{2,S}$ in dB must be used for the classification process; these can only be documented via room acoustics simulations.

In large multi-person offices, highly comfortable room acoustics conditions can only be achieved in open office structures with a sound-absorbing ceiling and measures for shielding between workstation groups. As sound-absorbing areas on the ceiling have a significantly higher impact in terms of sound propagation damping than those on the floor, additional points can be awarded for these. Comfortable room acoustics conditions can also be achieved with floor-to-ceiling room dividers which absorb sound on both sides, and in this case the additional points for sound absorption areas on the ceiling and the room dividers can be awarded.

Alternatively, verification for completed projects can be carried out via measurements in accordance with the standard method of DIN EN ISO 3382-2 in an unoccupied empty or furnished state.

Indicator 4: Rooms in accordance with DIN 18041:2016-03 (room group A1–A5) with special requirements in terms of speech intelligibility (such as meeting rooms, seminar rooms or classrooms)
For meeting or seminar rooms, the room acoustics recommendations for the building uses of room groups A1–A5 in accordance with DIN 18041:2016-03 "Acoustic quality in rooms – Specifications and instructions for the room acoustic design" must be calculated and their compliance with the requirements must be documented. The room groups that are to be documented are described in Table 1 of DIN **18041:2016-03**.
Noise damping measures in rooms for "speech/lecture" or "teaching/communication" can be assessed on the basis of the reverberation time in furnished rooms with 80% occupancy.
Verification is carried out via calculation of the reverberation time of the room under consideration while furnished and with 80% occupancy in accordance with the calculation specifications of DIN 18041:2016-03. The values used for sound absorption of persons and furnishings must be documented.

If all requirements for **inclusive** use in accordance with DIN 18041:2016-03 are additionally complied with, this will be evaluated positively.

Alternatively, verification can be carried out via measurements in accordance with the standard method of DIN EN ISO 3382-2 in an unoccupied furnished state. An occupancy level of 80% must be taken into account in the calculations.

Indicator 5: Rooms with recommendations in accordance with DIN 18041:2016-03 (building use B3–B5) with special requirements for noise reduction and/or room acoustics comfort (such as cafeterias, libraries or break rooms)
The room damping in rooms of building usage types B3–B5 with special requirements for noise reduction and/or the room acoustics comfort is implemented via the reverberation time while furnished and with 50% occupancy level, in accordance with DIN 18041. Compliance with the recommendations for the A/V ratio in the frequency range 250–2000 Hz is required to achieve good room acoustics conditions. The room groups are described in Table 2 of the DIN

standard.
The values used for sound absorption of persons and furnishings must be documented.

Alternatively, verification can be carried out via measurements in accordance with the standard method of DIN EN ISO 3382-2 in an unoccupied furnished state. An occupancy level of 50% must be taken into account in the calculations.

As an alternative to indicators 1–5: Completion of a detailed acoustic simulation
Conventional statistical calculation methods can be used to determine average reverberation time values that are sufficient for assessing rooms with typical uses and geometries. For rooms with special geometries and requirements in terms of room acoustics quality, detailed calculation methods with location-specific parameters are required to develop optimal room acoustics conditions. Room acoustics simulation calculations can be used to determine the effectiveness of room acoustics measures in detail and check and evaluate even the more complex room acoustics conditions.

Indicator 6: AGENDA 2030 BONUS – Stress reduction, health and well-being
Long-term exposure to noise can have a huge impact on our cardiovascular system and sleeping patterns, and can lead to diseases such as high blood pressure, heart attacks and strokes. The objective is therefore to achieve a high level of acoustic quality and comfort for building users in order to minimise noise levels as a harmful factor. The minimum requirement for awarding points is that the quality listed below has been achieved and confirmed via measurements in indicators 2–5.

2.1 "Individual offices and multi-person offices up to 40 m²/compliance with the requirements for reverberation times"

- At least: compliance with the basic requirements of indicator 2

3.1 "Multi-person offices larger than 40 m²/compliance with the requirements for reverberation times"

At least: compliance with the basic requirements of indicator 3

4.1 "Rooms in accordance with DIN 18041:2016-03 (room group A1–A5) with special requirements in terms of speech intelligibility (such as meeting rooms, seminar rooms or classrooms)/compliance with the requirements for the reverberation time T target"

- Compliance with the requirements for inclusion

5.1 "Rooms with recommendations in accordance with DIN 18041:2016-03 (building uses B3–B5) with special requirements for noise reduction and/or room acoustics comfort (such as cafeterias, libraries or break rooms)"

- Compliance with the recommendations for the A/V ratio in the frequency range 250–2000 Hz as a minimum

IV. Usage-specific description

Assembly buildings

For the assessment in this criterion, assembly buildings are divided into the following building types:

- Type I: Congress buildings;
- Type II: Theatres and concert halls;
- Type III: Museums, cultural- and civic centres, libraries;
- Type IV: Trade fair and city halls,

Note: “Assembly buildings” that are not listed above as a building type can be assigned to one of the building types. If an assignment is not possible, we ask for direct communication with the DGNB office.

A distinction is made between the application and evaluation of the individual indicators on the basis of building or land use. A DGNB tool supports the assignment of the indicators and the evaluation of the criterion.

In principle, at least 95% of the representative rooms must correspond to the assessed quality level.
According to variant 1, the evaluation is to be carried out area-weighted on the basis of the actual area ratios NUF (R) according to DIN 277-1; each of the indicators is weighted as a percentage with the area share of the associated use; the maximum possible number of points is related to the rooms actually available and to be considered. Variant 2 cannot be used for the usage profile for **Assembly buildings**.

Rooms with special uses that cannot be assigned in accordance with DIN 18041 must be treated separately.

Indicator 4: Rooms according to DIN 18041: 2016-03 (room group A1 - A5) with special requirements for speech intelligibility (e.g. meeting rooms, seminar rooms, classrooms)
For **type II** (theatres and concert halls), good room acoustics are crucial for the success of the house. Since the requirements are very different depending on the project, detailed acoustic simulations and the acoustician's classification of the acoustic conditions to be expected on the basis of key figures are used for the evaluation.

Indicator 5: Rooms with recommendations according to DIN 18041: 2016-03 (type of use B3 - B5) with special requirements for noise reduction and / or room acoustic comfort (e.g. canteens, libraries, break rooms)
In the case of **Assembly buildings**, in addition to the type B3 - B5 rooms, the type B2 rooms must be also considered. Within the indicator there is the possibility of evaluating the relevant rooms (corresponding to the B2, B3, B4, B5 types) weighted by area.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements. In the case of **Assembly buildings**, assignment of the building to the certain type must be argued and documented.

Indicator 1: Acoustic concept formulated during the planning process

- Room acoustics concept with detailed description of the measures implemented in the rooms in accordance with room groups A and B as per DIN 18041:2016-03, transparent representation of the updates during the planning process as well as transparent consideration of the interaction between room acoustics and architectural planning as well as the interaction with other construction tasks.

Indicator 2: Individual offices and multi-person offices up to an area of 40 m²

- The basis and result of the calculation as well as measurement of the reverberation time. Documentation of the values used for sound absorption of persons and furnishings.
- As an alternative to compliance with room acoustics class B in accordance with VDI 2569: 2016-02 (draft), documentation can be performed using the requirements for room group B in accordance with DIN 18041:2016-03: Cf. indicator 5.

Indicator 3: Multi-person offices with an area of more than 40 m²

- The basis and result of the calculation as well as measurement of the reverberation time.
- Documentation of the values used for sound absorption of persons and furnishings.
- As an alternative documentation can be performed using the requirements for room group B in accordance with DIN 18041:2016-03: Cf. indicator 5.
- Documentation of the sound absorption measures implemented on the ceiling or in the form of room dividers, e.g. by means of an order confirmation and photo documentation.

Indicator 4: Rooms in accordance with DIN 18041:2016-03 (room group A1–A5) with special requirements regarding speech intelligibility

- The basis and result of the calculation as well as measurement of the reverberation time of the sound-absorbing areas.
- Documentation of the values used for sound absorption of persons and furnishings.
- **Assembly buildings** – Type II: Documentation of the detailed acoustic simulations as well as the acoustician's classification of the expected acoustic conditions.

Indicator 5: Rooms with recommendations in accordance with DIN 18041:2016-03 (building uses B3–B5) with special requirements regarding noise reduction

- The basis and result of the calculation as well as measurement of the reverberation time.
- Documentation of the values used for sound absorption of persons and furnishings.

In addition to indicators 1–5: Completion of a detailed acoustic simulation

- Basis and results of the completed detailed acoustic simulation.

Indicator 6: AGENDA 2030 BONUS – Stress reduction, health and well-being

- Description of the results of the calculation as well as the measurements carried out.

I. Version

Change log based on version 2017

PAGE	EXPLANATION	DATE
all	General, Evaluation and Usage-specific description: scheme “Assembly buildings” has been added.	16.09.2021

II. Literature

- DIN 18041:2016-03. Acoustic quality in small to medium-sized rooms. Berlin: Beuth Verlag.
- DIN EN ISO 3382-2. Acoustics – Measurement of room acoustic parameters – Part 2: Reverberation time in ordinary rooms. Berlin: Beuth Verlag. September 2008
- DIN EN ISO 3382-2 Corrigendum 1:2009-09. Acoustics – Measurement of room acoustic parameters – Part 2: Reverberation time in ordinary rooms
- DIN EN ISO 354. Acoustics – Measurement of sound absorption in a reverberation room. Berlin: Beuth Verlag. December 2003
- VDI 2569: 2016-02 (draft) "Sound protection and acoustical design in offices". Düsseldorf: Verein Deutscher Ingenieure e.V.

APPENDIX 1

Requirements in accordance to DIN 18041

Indicator 4. Rooms in accordance with DIN 18041:2016-03 (room group A1–A5) with special requirements in terms of speech intelligibility

A1 "Music": Predominantly musical performances.

$T_{Soll,A1}=(0.45\lg\frac{V}{m3}+0.07)$ s 30 m³≤ V <1 000 m³

A2 "Language/Lecture": Linguistic performances are in the foreground, usually from a (frontal) position. Simultaneous communication between several people at different points in the room is rarely carried out.

$T_{Soll,A2}=(0.37\lg\frac{V}{m3}-0.14)$ s 50 m³≤ V <5 000 m³

A3 "Teaching/Communication" (to 1000 m³): Communication-intensive uses with several simultaneous speakers distributed in the room.
and
"Language/Lecture inclusive" (to 5000 m³): Rooms of type **A2** for people who are particularly dependent on good language comprehension. Required for inclusive use.

$T_{Soll,A3}=(0.32\lg\frac{V}{m3}-0.17)$ s 30 m³≤ V <5 000 m³

A4 "Teaching/communication inclusive": Communication-intensive uses with several simultaneous speakers distributed in the room according to type A3, but for people who are particularly dependent on good language comprehension. This type of use is not suitable for rooms larger than 500 m³ and for musical uses. Required for inclusive use.

$T_{Soll,A4=}(0.26\lg\frac{V}{m3}-0.14)$ s 30 m³≤ V <500 m³

A5 "Sport": In sports halls and swimming pools Multiple groups communicate (even at the same time) with different content.

$T_{Soll,A5}=(0.75\lg\frac{V}{m3}-1.00)$ s 200 m³≤ V <10 000 m³

$T_{Soll,A5}=2.0$ s V ≥10 000 m³

Indicator 5. Rooms with recommendations in accordance with DIN 18041:2016-03 (building use B3–B5) with special requirements for noise reduction and/or room acoustics comfort (such as cafeterias, libraries or break rooms)

Type of use	Description	by Room heights *h* ≤2.5 m m^2/m^3	by Room heights *h* >2.5 m m^2/m^3
B3	Rooms for longer-term lingering	$A/V \geq 0.20$	$A/V \geq [3.13+4.69 \ln (h/1\ m)]^{-1}$
B4	Rooms with need for noise reduction and room comfort	$A/V \geq 0.25$	$A/V \geq [2.13+4.69 \ln (h/1\ m)]^{-1}$
B5	Rooms with special need for noise reduction and room comfort	$A/V \geq 0.30$	$A/V \geq [1.47+4.69 \ln (h/1\ m)]^{-1}$

A the equivalent sound absorption surface of a room in square metres
V the volume of a room in cubic metres
h the light room height in metres

SOC1.4

Visual comfort

Objective

Our objective is to ensure sufficient, uninterrupted supply of daylight and artificial light in all interior areas which are in constant use. Visual comfort forms the basis of general well-being and efficient, productive work. Natural light has a positive effect on the mental and physical health of humans. In addition, efficient use of daylight provides a great deal of potential energy savings in terms of artificial lighting and cooling.

Benefits

User satisfaction is closely linked to feelings of comfort and well-being. Forecasts providing users with information regarding daylight hours, their surroundings, weather conditions, etc. are highly important in this regard. Visual comfort strongly affects user productivity and satisfaction.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO GERMAN SUSTAINABILITY STRATEGY	
1 Low	7.3	Double the improvement in energy efficiency	7.1.a/b	Resource conservation

Outlook

There are currently no plans to make any of the requirements stricter.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Assembly buildings**	3.1%	3
Education	2.7%	3
Residential	3.2%	3
Hotel	2.0%	2
Consumer market **Shopping centre** **Department stores**	3.4%	3
Logistics **Production**	3.2%	3

EVALUATION

In order to ensure sufficient and uninterrupted supply of daylight and artificial light, visual comfort is evaluated on the basis of seven indicators, depending on the specific use of the building. The availability of daylight in the entire building and at permanent workstations is assessed via indicators 1 and 2. Availability of direct view to the outside is acknowledged via indicator 3. Indicator 4 evaluates the solar radiation/glare protection system in place. The artificial light conditions, the colour rendering index of the daylight and the duration of exposure to daylight are assessed in indicators 5 to 7. In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR		POINTS
1	**Availability of daylight for the entire building**		
1.1	**Daylight factor (DF)**		
	Office **Education** **Assembly buildings**		**10–18**
	Residential		**20–40**
	Hotel		**16–34**
	50% of the usable area (UA) has a daylight factor (DF) of		
	■ ≥ 1.0% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	**Office** **Education** **Assembly buildings**	10
		Residential	20
		Hotel	16
	■ ≥ 1.5% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	**Office** **Education** **Assembly buildings**	14
		Residential	30
		Hotel	25
	■ ≥ 2.0% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	**Office** **Education** **Assembly buildings**	18
		Residential	40
		Hotel	34
	Consumer market		
	Areas illuminated via side windows have a daylight factor of at least 1.0% and areas illuminated via skylights have a daylight factor of at least 2.0%. The area illuminated with daylight is determined by superimposing all areas illuminated with daylight (combined area).		**Max. 45**
	■ The combined area features the following proportion of the usable area (UA:		**+ 15–35**
	■ A ≥ 15% of UA		15
	■ A ≥ 25% of UA		25
	■ A ≥ 50% of UA		35
	■ Uniformity of the daylight supply in the area illuminated by the skylights:		**+ 10**

The distance between the midpoints of the skylights is not greater than the clear room height. Alternatively, uniformity ($g_1 = D_{min}/D_{average}$) of the area illuminated via skylights of more than 0.5 can be documented via a daylight simulation.

Shopping centre

Daylight factors of at least 2.0%	**10–30**
■ A ≥ 15% of UA	10
■ A ≥ 25% of UA	20
■ A ≥ 50% of UA	30

Department stores

Areas illuminated via side windows have a daylight factor of at least 1.0% and areas illuminated via skylights have a daylight factor of at least 2.0%. The area illuminated with daylight is determined by superimposing all areas illuminated with daylight (combined area).	**10–40**
The combined area features the following proportion of the usable area (UA:	
■ A ≥ 5% of the UA	10
■ A ≥ 10% of the UA	25
■ A ≥ 15% of the UA	40

Production buildings

50% of the usable area (UA has a daylight factor (DF) of	**15–30**
■ ≥ 0.5% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	15
■ ≥ 0.75% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	20
■ ≥ 1.0% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	30

Not applicable for **Logistics**

2 Availability of daylight at permanent workstations

2.1 Annual relative motive exposure

Office **Education** **Logistics** office part **Assembly buildings** area Type I **8–16**

Annual relative useful exposure

■ ≥ 45% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	8
■ ≥ 60% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	12
■ ≥ 75% (with documentation via simulation or calculation with detailed documentation of the obstruction index I_{VJ})	16

Logistics industrial part	**6–12**
Assembly buildings area Type II	**8–16**

Proportion of the roof surface area represented by translucent skylights (proportion of industrial work)

■ ≥ 0.5%	**Logistics**	6
	Assembly buildings	8
■ ≥ 2.0%	**Logistics**	9
	Assembly buildings	12
■ ≥ 4.0%	**Logistics**	12
	Assembly buildings	16

Not applicable for **Residential** **Hotel** **Consumer market** **Shopping centre** **Department stores** **Production buildings**

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3 Visual contact with the outside

3.1 Availability of line of sight to the outside

Shopping centre **Department stores** — **Max. 30**

Consumer market — **Max. 18**

■ Direct visual link to the outside for all office rooms Direct visual link to the outside for 80% of all break and social rooms	**Shopping centre** **Department stores**	+5
	Consumer market	+9
■ Proportion of the total net sales area represented by the open façade area (not including the shop façades in the mall) 0% to 5%	**Shopping centre** **Department stores**	+ 0–15
■ There are shop areas with direct lines of sight to the outside	**Shopping centre** **Department stores**	+5
■ 0% to 50% of the façade area of the shop areas has a direct line of sight to the outside	**Shopping centre** **Department stores**	+ 0–5
■ A direct visual link to the outside is possible from all checkout workstations.	**Consumer market**	+9

Office **Education** **Hotel** **Logistics** — **Max. 16**

Assembly buildings area Type I and II

Residential — **Max. 20**

(If the building has both a solar radiation protection system and a glare protection system at the same time with different classifications, the evaluation will be carried out on the basis of the better classification.)

■ Visual contact to the outside is possible	**Residential**	10
Assembly buildings area Type II	**Office** **Education**	8
■ Daylight is available from the lounge areas (e.g. event room, foyer).	**Hotel** **Logistics** **Assembly buildings**	
Visual contact to the outside in direct field of vision from the workstation, the living area or hotel room is possible	**Residential**	15
	Office **Education**	12

Assembly buildings area Type II — **Hotel** **Logistics** **Assembly buildings**

- Visual contact from the lounge areas (e.g. event room, foyer) to the outside area is possible.

Visual contact to the outside in the direct field of vision from the workstation, the living area or hotel room is possible, even when the glare protection system or solar radiation protection system is down — **Residential** 20; **Office** **Education** 16; **Hotel** **Logistics** **Assembly buildings**

Assembly buildings area Type II

- Visual contact to the outside in the direct field of vision from the common areas (e.g. event room, foyer) possible.

Not applicable for **Production buildings**

4 Absence of glare in daylight

4.1 Absence of glare due to solar radiation/glare protection system

Office **Education** — **Max. 16**

Assembly buildings area Type I

Assembly buildings area Type II **(Variable)**

(If the building has both a solar radiation protection system and a glare protection system at the same time with different classifications, the evaluation will be carried out on the basis of the better classification.

Annual relative useful exposure).

- Solar radiation/glare protection system available (with no additional documentation of the quality in accordance with DIN EN 14501) — 8
- Solar radiation/glare protection system = class 1 — 12
- Solar radiation/glare protection system ≥ class 2 — 16

Additionally for **Assembly buildings** area Type II **(Variable)**

- Light-directing systems in combination with glare protection with direct light suppression available.
  or:
  Use of skylights with a high proportion of diffuse northern light (e.g. shed roof) — 16

Consumer market — **12**

- Requirements in accordance with workplace regulation A3.4 Section 4.2 have been complied with

Logistics — **Max. 13**

- Solar radiation/glare protection system < class 1 — 6
- Solar radiation/glare protection system = class 1 — 9
- Solar radiation/glare protection system ≥ class 2 — 13

Production — **24**

- Light-diverting systems in combination with glare protection with direct light filtering available.

or:
Use of skylights with high percentage of diffusion of northern light (e.g. saw-tooth roof)

Not applicable for **Residential** **Shopping centre** **Department stores** **Hotel**

5 Artificial lighting

5.1 Minimum requirements for artificial lighting

Office **Education** **Hotel** **Consumer market** **Department stores** **Assembly buildings**

■ The requirements for lighting in accordance with DIN EN 12464-1 have been complied with.	**Office** **Education**	**16**
	Assembly buildings **Hotel**	**12**
	Consumer market	**15**
	Department stores	**20**

Logistics		**Max. 20**
Production		**Max. 30**
■ Numerical criteria in accordance with DIN EN 12464-1 have been complied with for artificial lighting: $\bar{E}_m$: Maintained illuminance value U_o: Uniformity of illuminance UGR_L: Glare limitation R_a: Colour rendering	**Logistics**	+20
	Production	+30

Shopping centre (does not apply for tenant areas)	**+ Max. 10**
■ Numerical criteria in accordance with DIN EN 12464-1 have been complied with for artificial lighting: $\bar{E}_m$: Maintained illuminance value UGR_L: Glare limitation R_a: Colour rendering	+5
■ Automatic adjustment of the artificial light in areas supplied with daylight via dimmable lights or incremental light control	+5

Not applicable for **Residential**

5.2 Artificial lighting over-fulfilment

Office **Education** **Hotel** **Consumer market** **Department stores**

Possible over-fulfilment features:

- Colour rendering $R_a \geq 90$
- Illuminance on the walls $Ev_{Wall} \geq 150$ lx

- Automatic or individual adjustment of the illuminance via artificial lighting (> 800 lx)
- Automatic or individual adjustment of the light colour via artificial lighting in the range of warm white (3000 K) to daylight white (6500 K) (for new **Hotel**: 6000 K)

Additionally for **Education**

- Light management with brightness and presence detection depending on daylight
- In classrooms: Additional lighting for the blackboard that can be

switched on and off separately

Additionally for **Consumer market** **Department stores**

- Artificial light planning takes into account the results of a daylight analysis (e.g. via suitable zoning and management)

Office **Education** **Consumer market** **Department stores** **Max. 10**

Hotel **Max. 8**

Number of features implemented:

1		3
2		6
	Hotel	5
≥ 3		10
	Hotel	8

Shopping centre (does not apply for tenant areas) **Max. 20**

Possible over-fulfilment features:

- Increased colour rendering Ra ≥ 90
- Cylindrical illuminance E cyl ≥ 150 lx
- Automatic adjustment of the illuminance via artificial light (> 800 lx) is possible
- Automatic adjustment of the light colour via artificial light at least in the range of warm white (3000 K) to daylight white (6000 K)
- Artificial lighting concept that encourages ambiance (e.g. zoning, pools of light)
- A concept for preventing light pollution at night is planned and implemented
- All mall entrances and transition areas are designed as adaptation zones for dark adaptation.
- Artificial light planning takes into account the results of a daylight analysis (e.g. via suitable zoning and management)

Number of features implemented:

1	5
2	10
3	15
≥ 4	20

Logistics **Production buildings** **Max. 8**

Possible over-fulfilment features:

- Increased colour rendering Ra ≥ 90
- Automatic or individual adjustment of the illuminance via artificial light (> 800 lx)
- Automatic or individual adjustment of the light colour via artificial light in the range of warm white (3000 K) to daylight white (6000 K)

Number of features implemented:

1	4

- 2 — 6
- 3 — 8

Assembly buildings — **Max. 12**

- Artificial light plan from a specialist/expert is available
- Colour rendering Ra ≥ 90
- A lighting control with daylight-dependent brightness control has been implemented
- Automatic adjustment of the light colour via artificial light at least in the range of warm white (3000 K) to daylight white (6000 K)
- Artificial lighting concept that creates the mood (e.g. zoning, islands of light)

Number of features implemented:

- 1 — 4
- 2 — 8
- ≥ 3 — 12

Not applicable for **Residential**

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6 Daylight colour rendering

6.1 Colour rendering index R_a

Office **Education** **Production buildings**	**4–8**
Residential	**15–20**
Hotel **Logistics**	**8–15**
Shopping centre **Assembly buildings**	**5–10**

Colour rendering index R_a for the combination of glazing and solar radiation/glare protection, all daylit areas in constant use

Ra ≥ 80	**Office** **Education** **Production**	4
	Residential	15
	Hotel **Logistics**	8
	Shopping centre	5
Ra ≥ 90	**Office** **Education** **Production**	8
	Residential	20
	Hotel **Logistics**	15
	Shopping centre	10

Not applicable for **Consumer market** **Department stores**

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7 Exposure to daylight

7.1 Duration of exposure to daylight

Residential	**5–20**
Hotel	**8–15**

- Duration of exposure to daylight on 17th January ≥ 1 h and duration of exposure to daylight at the equinox ≥ 4 h, achieved for at least 40% of the living

Residential	5
Hotel	8

spaces (at least one living space per residential unit)/guest rental unit (hotel)		
■ Duration of exposure to daylight on 17th January ≥ 1 h and duration of exposure to daylight at the equinox ≥ 4 h, achieved for at least 60% of the living spaces (at least one living space per residential unit)/guest rental unit (hotel)		10
■ Duration of exposure to daylight on 17th January ≥ 1 h and duration of exposure to daylight at the equinox ≥ 4 h, achieved for at least 80% of the living spaces (at least one living space per residential unit)/guest rental unit (hotel)	**Residential**	15
	Hotel	13
■ Duration of exposure to daylight on 17th January ≥ 1 h and duration of exposure to daylight at the equinox ≥ 4 h, achieved for 100% of the living spaces/guest rental units (hotel)	**Residential**	20
	Hotel	15

Not applicable for **Office** **Education** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production buildings** **Assembly buildings**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPIs) include communicating indicators regarding daylight, direct visual links to the outside, artificial light qualities and glazing qualities, as well as durations of exposure to daylight.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Daylight factor (DF) for 50% of the usable area	[%]
KPI 2	Relative annual useful exposure	[%]
KPI 3	Proportion of the roof surface area represented by translucent skylights	[%]
KPI 4	Proportion of the rooms with direct visual link to the outside	[%]
KPI 5	Artificial light qualities: Colour rendering index, illuminance and rate of adjustment, light colour	[-]
KPI 6	Colour rendering index of the glazing	[%]
KPI 7	Durations of exposure to daylight (17th January and at the equinox) and proportion of rooms to which this information applies	[h]

Synergies with DGNB system applications

- **DGNB OPERATION:** Achieving high levels of quality in this criterion provides great potential for achieving high satisfaction rates during ongoing operation for criterion 9.1 of the Buildings in use (BIU) scheme (user satisfaction).
- **DGNB RENOVATED BUILDINGS:** Large similarities with criterion SOC1.4 in the REN scheme.
- **DGNB INTERIORS:** Large similarities with criterion SOC1.4 in the IR scheme.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

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II. Additional explanation

Visual comfort is achieved by means of balanced lighting, with no significant interferences such as direct and/or reflected glare, as well as by means of sufficient level of illumination and individual adjustment to suit the needs of specific users. Here, user satisfaction is closely linked to feelings of comfort and well-being. Forecasts providing users with information regarding daylight hours, their surroundings, weather conditions, etc. are essential in this regard. Additional criteria include absence of glare, light distribution and the light colour in the room. These requirements apply in principle to use of daylight and artificial light, where the evaluation of the daylight supply in the interior plays a particularly important role. For this reason, sufficient, disturbance-free supply of daylight and artificial light must be available for all interior areas in constant use.

III. Method

Indicator 1: Availability of daylight for the entire building
The daylight factor (DF) and the corresponding portion of the usable area (UA), area definition according to the chapter “Terms and definitions” [T&D_04]. Documentation can be carried out either via simulation or in accordance with DIN V 18599, with detailed documentation of the obstruction index I_{VJ} (or, in the case of hotels, with a lump sum approach for the obstruction index I_{VJ}).

Indicator 2: Availability of daylight at permanent workstations
The relative annual useful exposure and the corresponding portion of the permanent workstations must be determined. Documentation can be carried out either via simulation or in accordance with DIN V 18599, with detailed documentation of the obstruction index I_{VJ} (or, in the case of hotels, with a lump sum approach for the obstruction index I_{VJ}).

Indicator 3: Visual contact with the outside
Visual contact with the outside must be determined qualitatively via the floor plan and the type of solar radiation/glare protection used.

Indicator 4: Absence of glare in daylight
The solar radiation/glare protection must be classified with regard to its glare protection function in accordance with DIN 14501, Section 6.3. For **Consumer markets**, compliance with the occupational health and safety guidelines (ASR) A3.4, Section 4.2 must be documented. For **Production buildings**, if skylights are used, the proportion of the lit areas must be stated, and the glare protection system, if used, must be described.

Indicator 5: Artificial light

The evaluation of the indicator is divided into minimum requirements and possible over-fulfilments. Points for an over-fulfilment can only be awarded if the minimum requirements for the area under assessment are met. The evaluation can be carried out on an area-weighted basis for partial areas.

The reference values for lighting requirements are summarised in DIN EN 12464-1, separated by use. The following values must be considered:

- $\bar{E}_m$ Maintained illuminance value [lx]
- UGR_L Glare limitation [-]
- U_o Uniformity of illuminance [-]
- R_a Colour rendering [-]
- $E_{V\ Wall}$ Illuminance on the walls [lx]
- L Luminance limits for lights at workstations with monitors [cd·m−2]

Indicator 6: Daylight colour rendering

The colour rendering index Ra for the combination of glazing and solar radiation/glare protection, all daylit areas in constant use must be determined.

Indicator 7: Exposure to daylight

The duration of exposure to daylight of building windows must be established on 17th January and 21st March/21st September (equinox) using suitable calculations for shading. When doing so, in accordance with DIN 5034, all external shading, e.g. due to adjacent buildings, topography, the courtyard/atrium, plants/trees, etc., must be taken into account.

IV. Usage-specific description

Education

Indicator 2: Availability of daylight at permanent workstations

The areas under evaluation are not just restricted to the workstations in the administration offices, usable area (UA 2 – Office work in accordance with DIN 277-1 [T&D_04]). The affected areas in usable area (UA 5 – Education, teaching and culture in accordance with DIN 277-1 [T&D_04] must also be taken into account.

Consumer market **Shopping centre** **Department stores**

The issue of lighting plays a significant role in retail buildings. Firstly, the energy demand for artificial lighting is generally very high, meaning that optimisation involving increased use of daylight provides substantial potential savings. Secondly, retail buildings are, for example, generally subject to different requirements than offices in terms of lighting, as both permanent and short stays play a role. Daylighting is currently hardly utilised in retail buildings. However, the acceptability of the indoor climate is closely linked to comfort at the workplace, which naturally also includes employees in retail buildings. In addition, studies have clearly shown that using daylight can positively affect purchasing behaviour, including in retail buildings. As the two groups under consideration – employees and customers – are fundamentally different from one another, the reference to each of the group under consideration is established separately and, if necessary, treated differently.

*Employees**

For employees, visual comfort forms the basis of efficient, productive work. In addition, good use of daylight provides a great deal of potential energy savings in terms of artificial light and cooling. The acceptability of the indoor climate (thermal comfort, air quality, noise and lighting), particularly the lighting conditions, is closely linked to satisfaction. For this reason, sufficient, disturbance-free lighting must be available in all interior areas which are in constant use. For psychological and physiological reasons, daylight is always preferable to artificial light, and a suitable visual connection to the outside world should be established.

*Employees are all persons working in continuously occupied areas. Continuously occupied areas include: sales rooms, office rooms, kitchens, checkouts, customer service points, etc.

Customers

For customers, visual comfort is equally vital for ensuring well-being, and thereby also affects their length of stay. Studies have determined that purchasing activity is higher in retail buildings lit with daylight and have thereby established a positive monetary impact as well. Adjusting the interior lighting to suit the daylight situation also provides potential energy savings. In addition, accent lighting provides customers with important guidance to find their way through the building/store. Appropriate light planning, taking into account daylight and artificial light, must be ensured and must incorporate energy aspects, physiological aspects and functional aspects.

Indicator 3: Visual contact with the outside

Direct sight to outside from the checkout workstations.

Visual contact with the outside must be established via graphical entries in the floor plan. This applies to all checkout workstations where the line of sight to a window or glazed door is not blocked by permanent installations. Transparent internal walls or open staircases (e.g. escalators) are not classified as blocking elements for the purposes of this indicator. The windows or doors that provide a view to the outside must be designed to be transparent at a height of 1 m to 2.2 m.

Definition

Mall spaces: All publicly accessible areas (i.e. areas that are not lockable) of the shopping street must be taken into account, including food areas, open sales areas, open staircases, etc. Ancillary areas, etc. can be ignored by the auditor with proper justification.

Definition of rental space: The rental space must be considered to comprise all rentable floor areas listed in Appendix 1. Tenant fit outs, including light separating walls, may be ignored.

Logistics

The requirements for visual comfort vary for office and industrial areas.

For offices with UA (in accordance with DIN 277-1 [T&D_04]) of ≥ 400 m² or ≥ 20 permanent workstations, the visual comfort for both office and industrial areas must be analysed.

1. Number of office workstations ≥ 15% of the total workstations or ≥ 20 permanent office workstations:

Evaluation of proportion of office area and proportion of industrial area:

For the evaluation, the proportion of office area and the proportion of industrial area must be analysed in the individual indicators.

$$\text{Points}_{\text{total}} = \text{points}_{\text{office portion}} \times (\text{number of office workstations} / \text{number of total workstations}) + \text{Points}_{\text{industrial work portion}} \times (\text{number of industrial workstations} / \text{number of total workstations})$$

2. Number of office workstations < 15% of the total workstations and < 20 permanent office workstations:

Evaluation of proportion of industrial area:

For the evaluation, the proportion of industrial area must be analysed in the individual indicators.

$$\text{Points}_{\text{total}} = \text{points}_{\text{industrial work portion}}$$

Indicator 2: Availability of daylight at permanent workstations:

The availability of daylight, via the external walls, in the hall area of logistics buildings is limited due to the wide expanse of the halls. For this reason, the halls are supplied with daylight, if at all, via skylights. The low area proportion is balanced out by the fact that the light output of skylights is higher than vertical windows (approx. four times higher). The problem of stored goods being exposed to unwanted heat and UV radiation can be balanced out by not situating the skylights in shelving areas, where there are no permanent workstations, and instead concentrating them in the order picking area and other similar permanent workstations.

Assembly buildings

Area assignments:

For the scheme **Assembly buildings**, different areas to be weighted and evaluated according to the different typology of areas defined in Appendix 1:

Areas under the Type I:

- Workplaces in administrative offices (UA 2 – office work [T&D_04]);
- Event rooms or workplace rooms with the visual requirements similar to offices, which, however, are assigned to UA 5 – rooms for education, teaching and culture, in accordance with DIN 277-1 [T&D_04] (e.g. in lecture halls, seminar rooms, work rooms, library rooms, reading rooms). Foyer areas that are also used as event areas are to be assigned to this type;

Areas under the Type II:

- Event rooms, such as exhibition rooms (in museums, galleries, etc.), exhibition halls which, due to their main use (purpose), do not allow any or only a small amount of daylight, as well as due to their special purpose, have large volumes of space (hall character) where daylight is only available and useful to a small extent via the external walls. Rooms that do not require daylight due to the special requirements (such as cinemas) do not have to be considered.

Evaluation:

- Areas type I: application of the method according to the **Education** based on the "annual relative useful exposure";
- Areas type II: application of the method according to **Logistics** based on the "translucent skylight portion of the roof area";
- If no assignment to the type I or type II is given, all areas must be considered in accordance with the Appendix 1 of this criterion;

Indicator 1: Availability of daylight for the entire building

This indicator assesses the daylight availability for the entire building. The following areas are assessed in accordance with the Appendix 1: Usable areas (UA) 1-7 according to DIN 277-2 (chapter 4 “Terms and definitions” [T&D_04]) excluding those areas that do not require daylight due to their special typological requirements for operation e.g. cinema halls.

Indicator 3: Visual contact with the outside

The visual connection to the outside of all surfaces represents an optimum for the visual comfort of the “Assembly buildings”. In the areas in which a visual connection to the outside is not possible, availability of a daylight reference e.g. daylight created by the ribbon windows, so that the times of day and lighting conditions can be identified, will be assessed positively. For “Assembly buildings” with special requirements e.g. concert halls and cinema buildings where no permanent daylight availability is required, a positive evaluation will be still granted if a temporary daylight reference will be possible, e.g. in foyers, this will highlight the flexibility of area usage. For “Assembly buildings”, the areas to be assigned to the relevant types (according to indicator 2) and to be assessed on an area-weighted basis. For area type I, evidence of the minimum proportion of window areas in accordance with DIN 5034 must be provided. The determination of the class (0 to 4) of the sun / glare protection with regard to the visual contact to the outside is based according to DIN 14501, Table 10, the assessment of the class (0 to 4) of the solar radiation/glare protection with regard to visual contact with the outside is based on the vertical-vertical light transmittance $\tau_{v,\text{n-n}}$ and the proportion of the light transmittance that is diffused $\tau_{v,\text{n-dif}}$ (s. Appendix 2).

Indicator 4: Absence of glare in daylight

For “Assembly buildings”, areas to be assigned to the certain use types (according to indicator 2 and to be assessed on an area-weighted basis:

- For type I areas, compliance with the occupational safety guideline (ASR) A3.4 chapter 4.2 must be proven. The sun / glare protection is with regard to the glare protection function according to DIN14501, chap. 6.3 to be classified.
- For areas assigned to the type II usage, the presence of light-directing systems in combination with glare protection and direct light suppression or in the case of roof skylights with a high proportion of diffuse northern lights will be assessed positively.
- Variable: indicator can be set to “not relevant” for buildings that can be assumed to be glare-free due to their use.

Appendix 1

APPENDIX 1 AREAS OF THE SCHEMES TO BE TAKEN INTO ACCOUNT

Office

SCHEME	USE GROUP	FLOOR AREA AND ROOMS	INDICATOR						
			1	2	3	4	5	6	7
NEW OFFICE BUILDINGS	1_Residential and recreation (Portion of rooms for socialisation)	Common rooms Break rooms Waiting rooms Dining rooms	x		x		x		
	2_Office work	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms	x	x	x	x	x	x	

Education

NEW BUILDINGS EDUCATIONAL BUILDINGS	1_Residential and recreation (Portion of rooms for socialisation)	Common rooms Break rooms Waiting rooms Dining rooms	x		x		x	x	
	2_Office work (Portion of administrative work)	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms	x	x	x	x	x	x	

	3_Production, manual and machine work, experiment (Portion of industrial work)	Workshops (where these are permanent workstations) Technological laboratories Physics, engineering physics and electrical engineering laboratories Chemistry, bacteriology and morphology laboratories			x	x	x	x	
	5_Education, teaching and culture	Classrooms with fixed seating (lecture halls, including experimental lecture halls; auditoriums) General classrooms and practice rooms without fixed seating (classrooms and group rooms, seminar rooms, student workspaces) Special classrooms and practice rooms without fixed seating (work and craft rooms, training rooms, language rooms, special drawing classrooms, rooms for graphic design, painting and sculpture, rooms and practice booths for singing, language and instrumental training, rooms for home economics lessons)	x	x	x	x	x	x	

Residential

NEW BUILDINGS RESIDENTIAL BUILDINGS	1_Residential and recreation	Living spaces Common rooms Break rooms Waiting rooms Dining rooms	x		x			x	x

Consumer market

NEW BUILDINGS RETAIL	1_Residential and recreation (Portion of rooms for socialisation)	Common rooms Break rooms Waiting rooms Dining rooms	x		x				

	2_Office work	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms	x	x	x	x	x	x	
	1_Residential and recreation (Portion of rooms for socialisation)	Common rooms Break rooms Waiting rooms Dining rooms	x		x		x		
	2_Office work (Portion of administrative work)	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms	x		x	x	x		
	4_Distribution and sales	Sales rooms Showrooms For NSC, indicators 4 and 5 are not taken into consideration	x		x	x	x		

Shopping centre

NEW BUILDINGS RETAIL BUILDINGS	1_Residential and recreation (Portion of rooms for socialisation)	Common rooms Break rooms Waiting rooms Dining rooms	x		x		x		
	2_Office work (Portion of administrative work)	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms	x		x	x	x		

	4_Distribution and sales	Sales rooms Showrooms For NSC, indicators 4 and 5 are not taken into consideration	x		x	x	x		
	Mall	All publicly accessible areas (i.e. areas that are not lockable) of the shopping street must be taken into account, including food areas, open sales areas, open staircases, etc. Ancillary areas, etc. can be ignored by the auditor with proper justification.	x					x	

Department stores

NEW BUILDINGS RETAIL BUILDINGS	1_Residential and recreation (Portion of rooms for socialisation)	Common rooms Break rooms Waiting rooms Dining rooms	x		x		x		
	2_Office work (Portion of administrative work)	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms	x		x	x	x		
	4_Distribution and sales	Sales rooms (Checkout workstations) Showrooms (Workstations)	x		x		x		

Production buildings

NEW BUILDINGS INDUSTRIAL BUILDINGS	1_Residential and recreation (Portion of rooms for socialisation)	Common rooms Break rooms Waiting rooms Dining rooms			x				

	2_Office work (Portion of administrative work)	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms		x	x	x	x	x	
	3_Production, manual and machine work, experiment (Portion of industrial work)	Factory halls (where these are permanent workstations) Workshops (where these are permanent workstations) Technological laboratories Physics, engineering physics and electrical engineering laboratories Chemistry, bacteriology and morphology laboratories		x	x	x	x	x	
	4_Logistics halls (Portion of industrial work)	Logistics halls (where these are permanent workstations)		x	x	x	x	x	

Logistics

NEW BUILDINGS INDUSTRIAL BUILDINGS	1_Residential and recreation (Portion of rooms for socialisation)	Common rooms Break rooms Waiting rooms Dining rooms	x		x				
	2_Office work (Portion of administrative work)	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms	x	x	x	x	x	x	

	3_Production, manual and machine work, experiment (Portion of industrial work)	Factory halls (where these are permanent workstations) Workshops (where these are permanent workstations) Technological laboratories Physics, engineering physics and electrical engineering laboratories Chemistry, bacteriology and morphology laboratories	x	x	x	x	x	x	
	4_Logistics halls (Portion of industrial work)	Logistics halls (where these are permanent workstations)		x	x	x	x	x	

Hotel

NEW BUILDINGS HOTEL BUILDINGS	1_Residential and recreation	Living spaces (guest rooms) Common rooms Break rooms Waiting rooms Dining rooms	x		x			x	x
	2_Office work (Portion of administrative work)	Office rooms Open-plan offices Meeting rooms Design rooms Ticket offices Control rooms Surveillance rooms	x		x		x	x	

Assembly buildings

NEW BUILDINGS ASSEMBLY BUILDINGS	1_Residential and recreation (UA 1)	Living rooms, bedrooms, accommodation rooms, Kitchens in apartments, common rooms, lounges, ready rooms, break rooms, tea kitchens, rest rooms, waiting rooms, dining rooms, detention rooms	x		x	x	x	x	

	2_Office work (UA 2)	Office space, Open plan offices, meeting rooms, construction rooms, design rooms, Counter rooms, Supervision rooms, office equipment rooms	x	x	x	x	x	x	
	3_Production, manual and machine work, experiment (UA 3)	Factory halls (where these are permanent workstations) Workshops (where these are permanent workstations) Laboratories, Rooms for keeping animals, Rooms for plant cultivation, commercial kitchens, special work rooms	x	x	x	x	x	x	
	4_Storage, distribution, sales (UA 4)	Storage and pantry rooms, warehouses, vaults, silo rooms, archives, collection rooms, registries, cold rooms, reception and distribution rooms, packing rooms, sales rooms, exhibition rooms	x	x	x	x	x	x	
NEW BUILDINGS ASSEMBLY BUILDINGS	5_Education, teaching and culture (UA 5)	Classrooms and practice rooms, lecture halls, seminar rooms, work rooms, internship rooms, library rooms, reading rooms, sports rooms, gymnastics rooms, auditoriums (in cinemas, theatres, sports halls, etc.), stage rooms, studio rooms, rehearsal rooms, exhibition rooms (in museums, galleries, etc.), sacred rooms	x	x	x	x	x	x	

	7_Other uses (UA 7)	Storage rooms, bicycle rooms, garbage collection rooms, vehicle parking areas, passenger lounge areas, technical systems for the operation of usage-specific facilities, technical systems for the supply and disposal of other structures, Shelters, Sanitary rooms, changing rooms (cupboards, artists' dressing rooms, etc.), cleaning locks	x		x				
NEW BUILDINGS ASSEMBLY BUILDINGS	All usable areas 1-7 according to the DIN 277-2 [T&D_04] excluding those areas that do not require daylight due to the typological requirements for the operation of the rooms. Note: circulation areas within rooms, in accordance with DIN 277-1: 2016-01; 4.7.4 do not belong to the circulation spaces (CS), but to the usable area (UA).		x		x	x		x	

Areas to be taken into account:

Indicator 1. Availability of daylight for the entire building

This indicator assesses the supply of daylight for the entire building. For this reason, the following area is evaluated:

Office **Education** **Consumer market** **Shopping centre** **Department stores** **Production**

Usable floor area in accordance with DIN 277-2 [see. T&D_04] includes corridors in open-plan offices, group offices or combi-offices that are in open-air contact with the workstations (classification of the specified areas as circulation areas is not possible as a result).

Residential **Hotel**

Permanently used/occupied rooms

Assembly buildings

Usable areas (UA) 1-7 in accordance with DIN 277-2 [see. T&D_04] excluding areas that do not require daylight due to the typological requirements for the use (e.g. cinema halls). A list of areas with the corresponding allocation and explanations must be enclosed with the verification.

2. Availability of daylight at permanent workstations

Office **Education** **Logistics** **Assembly buildings**

Corridors in open-plan offices, group offices or combi-offices that cannot be converted into workstations – contrary to DIN 277-2 and DIN V 18599, as well as indicator 1 – must not be allocated to the usable floor area that is taken into account, but are instead considered to be circulation areas and are therefore not taken into account.

This applies if the corridors

a) have a ceiling height lower than the surrounding offices (panelling for supply ducts) and

b) have a different source of artificial light (corridor lighting instead of office lighting)

In both cases, clear verification documentation must be compiled.

3. Visual contact with the outside

Office **Education** **Residential** **Hotel** **Logistics** **Consumer market** **Shopping centre** **Department stores**

Permanently used/occupied rooms

4. Absence of glare in daylight

Office **Education** **Logistics** **Production** **Consumer market** **Assembly buildings**

Permanent workstations

5. Artificial light

Office **Education** **Logistics** **Production** **Shopping centre** **Department stores**

Permanently used/occupied rooms

Logistics **Production** **Hotel**

Permanent workstations

Consumer market

Min. 80% of the total usable area to be verified and at least 80% of the permanent workstations.

6. Daylight colour rendering

Permanently used/occupied rooms

Consumer market

5. Artificial light

At least 80% of the total usable areas and at least 80% of the permanent workstations should be documented

Logistics Production **Hotel**

5. Artificial light

Permanent workstations

6. Colour rendering

Office **Education** **Residential** **Consumer market** **Shopping centre** **Department stores**

Permanently used/occupied rooms

Logistics **Production** **Hotel**

Permanent workstations

7. Exposure to daylight

Residential **Hotel**

Living areas

Appendix 2

Indicator 1: Availability of daylight for the entire building

The availability of daylight for the entire building is documented using UA, which should achieve a certain daylight factor (0.5 to 2.0%) at minimum. When calculating the daylight factors, the following effects must be taken into account in accordance with DIN 5034, regardless of the selected documentation process:

- All external shading, e.g. due to adjacent buildings, topography, the courtyard/atrium, plants/trees, etc.
- Reduction as the daylight shines through the façade (light transmittance of the glazing, frames/sash bars, dirt, unusual angle of incidence of sunlight).

In general, the methods listed below are permitted for assessment of the portion of UA to be evaluated.
As DIN V 18599-4 does not in principle take into account shading due to trees/plants, but these do still reduce the amount of daylight that reaches the building, if shading due to trees/plants is expected or already exists, daylight simulations must be used as a documentation method when possible. If the simplified method in accordance with DIN V 18599-4 is used, plants must be assessed as obstructions to be on the safe side (estimation of the maximum height and width of the plants as building dimensions). Alternative to DIN 18599-4 the ISO 52000-1, module 9 (M9) can be used or the calculation method from the local energy performance certificate - EPC if this comply with the boundary conditions described in the criterion ENV1.1 “Building life cycle assessment”.

(1) Calculation using the simplified method of DIN V 18599-4

I. Breakdown of the rooms (zones) that are to be allocated to UA into

a) Area supplied with daylight A_{DL}

b) Area not supplied with daylight A_{NDL}

The following applies to all rooms in the usable area (UA) (see below): $A_{tot} = A_{DL} + A_{NDL}$

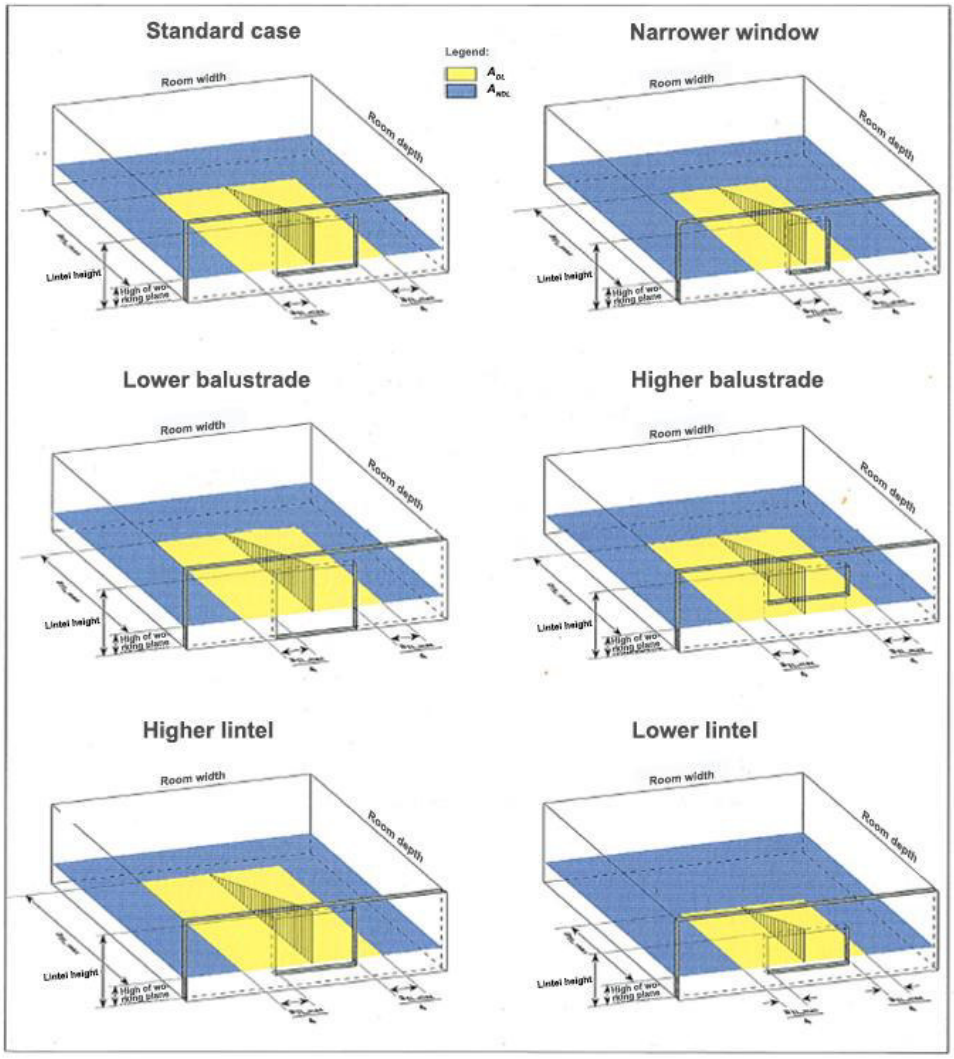


Fig. 4–21: Illustration of the effect of the window width and the lintel/ balustrade height on the area supplied with daylight

© *Heizen, Kühlen, Belüften & Beleuchten* – Bilanzierungsgrundlagen zur DIN V 18599 [Heating, cooling, ventilating and lighting – Fundamentals of balancing for DIN V 18599]; David, de Boer, Erhorn, Reiß, Rouvel, Schiller, Weiß, Wenning, published by Fraunhofer IRB Verlag, 2006, ISBN-13: 9-783-8167-7024-4

II. Reduction of the daylight factor D_{Rb} from the DIN V 18599-calculation

c) Adoption of the daylight factor D_{Rb} from the DIN V 18599 calculation, which only applies for the opening in the structural work.

d) Adoption of the approximated effective light transmittance $\tau_{eff,SNA}$ from the DIN V 18599 calculation.

e) Assessment of the actual effective daylight factor D_{eff}, taking into account reduction due to glazing, frames/sash bars, dirt, and non-vertical angle of incidence of sunlight, via the following equation:
$D_{eff} = D_{Rb} \cdot \tau_{eff,SNA}$

f) The obstruction index I_{Vj} must be determined in detail in accordance with DIN V 18599-4 (at least by storey or appropriate façade sections) and is incorporated into the assessment of D_{Rb}.
The lump sum approach to the obstruction index I_{Vj} = 0.9 – permitted in accordance with the EPC (e.g. *EnEV*, German energy saving ordnance, details under [T&D_03]) – does not sufficiently portray the actual shading in most cases and is therefore not permitted for the documentation of this indicator.

This effective daylight factor D_{eff} applies in accordance with the country specific EPC (e.g. DIN V 18599-4, [T&D_03]) as an average value over the axis at half of the depth of the area supplied with daylight in parallel to the façade area under consideration (see below):

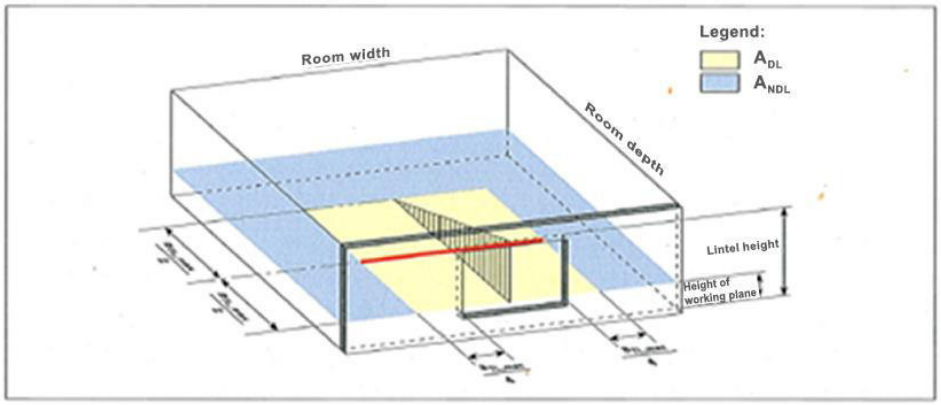


Fig. 4–28: Diagram of the check location for determining the daylight factor

© *Heizen, Kühlen, Belüften & Beleuchten* – Bilanzierungsgrundlagen zur DIN V 18599 [Heating, cooling, ventilating and lighting – Fundamentals of balancing for DIN V 18599]; David, de Boer, Erhorn, Reiß, Rouvel, Schiller, Weiß, Wenning, published by Fraunhofer IRB Verlag, 2006, ISBN-13: 9-783-8167-7024-4

I. Assessment of the portion $A_{1.0\%/1.5\%/2.0\%,j}$ of the area supplied with daylight A_{DL} in the room j that has a daylight factor of at least 1.0%/1.5%/2.0%, via linear **interpolation** of the depth of the area supplied with daylight $a_{1.0\%/1.5\%/2.0\%,j}$ that has a daylight factor of at least 1.0%/1.5%/2.0%:

$$a_{1,0\%,j} = \frac{a_{TL}}{2} + \frac{a_{TL}}{2} \cdot \left(\frac{D_{eff} - 1{,}0\%}{D_{eff}} \right)$$

$$a_{1,5\%,j} = \frac{a_{TL}}{2} + \frac{a_{TL}}{2} \cdot \left(\frac{D_{eff} - 1{,}5\%}{D_{eff}} \right)$$

$$a_{2,0\%,j} = \frac{a_{TL}}{2} + \frac{a_{TL}}{2} \cdot \left(\frac{D_{eff} - 2{,}0\%}{D_{eff}} \right)$$

II. The relevant depth of the area supplied with daylight $a_{1.0\%/1.5\%/2.0\%,j}$, which has a daylight factor of at least 1.0%/1.5%/2.0%, can be used together with the width of the area supplied with daylight $b_{DL,j}$ to derive the area in the room j with this daylight factor at minimum:

$$A_{1.0\%,j} = a_{1.0\%,j} \cdot b_{DL,j}$$

$$A_{1.5\%,j} = a_{1.5\%,j} \cdot b_{DL,j}$$

$$A_{2.0\%,j} = a_{2.0\%,j} \cdot b_{DL,j}$$

III. Assessment of the portion of the total UA in the building that has a daylight factor of at least 1.0%/1.5%/2.0% by simply determining the sum of the relevant partial areas $A_{1.0\%/1.5\%/2.0\%,j}$ across all n rooms in the building that must be allocated to UA, that is to be taken into account, meaning that the following equations apply:

$$A_{UA,1.0\%}=\sum_{j=1}^{n} A_{1.0\%,j}$$
$$A_{UA,1.5\%}=\sum_{j=1}^{n} A_{1.5\%,j}$$
$$A_{UA,2.0\%}=\sum_{j=1}^{n} A_{2.0\%,j}$$

The relevant partial area with a daylight factor of at least 1.0%/1.5%/2.0% is then compared to 50% of the usable area of the building, and the result can be classified in accordance with the evaluation table.

(1) Assessment via daylight simulations

When using daylight simulations to assess the daylight factor, it is not necessary to simulate all rooms within UA; it is sufficient to simulate a few representative rooms and apply the results to the remaining rooms in UA via appropriate interpolation.

(1) Assessment via daylight measurements

In accordance with DIN 5034, the daylight factors must in principle be measured with a completely overcast sky. Similar to the daylight simulations, it is not necessary to measure all rooms within UA; it is sufficient to measure the daylight factors in a few representative rooms and apply the results to the remaining rooms in UA via appropriate interpolation.

Indicator 2: Availability of daylight at permanent workstations

In general, the methods listed below are permitted for assessment of the relative annual useful exposure.
As DIN V 18599-4 does not in principle take into account shading due to trees/plants, but these do still reduce the amount of daylight that reaches the building, if shading due to trees/plants is expected or already exists, daylight simulations must be used as a documentation method, if possible. If the simplified method in accordance with DIN V 18599-4 is used, plants must be assessed as obstructions to be on the safe side (estimation of the maximum height and width of the plants as building dimensions).

Calculation using the simplified method of DIN V 18599-4

If the relative annual useful exposure is documented using DIN V 18599-4, the daylight supply factor $C_{DL,supp}$ must first be calculated. To do so, the obstruction index I_{Vj} must be determined in detail in accordance with DIN V 18599-4 and incorporated into the assessment of the daylight supply factor $C_{DL,supp}$ or the daylight factor of the opening in the structural work DRb.
The lump sum approach to the obstruction index I_{Vj} = 0.9 – permitted in accordance with EPC (e.g. EnEV, T&D_03) – does not sufficiently portray the actual shading in most cases and therefore results in a significant points penalty for documentation of this indicator.
If partial areas exist in the rooms with the permanent workstations that are not supplied with daylight in accordance with DIN V 18599-4[1] (i.e. the area supplied with daylight is smaller than the floor area of the rooms), the area in the rooms that is not supplied with daylight must be taken into account with an annual relative useful exposure of 0% in the area-weighted averaging of the daylight supply factor.
As the daylight supply factor $C_{DL,supp}$ in accordance with DIN V 18599-4 refers solely to the daylight hours (= use time while there is daylight) but the relative annual useful exposure in accordance with DIN 5034 nevertheless covers the entire use time (regardless of whether there is daylight), the daylight supply factor $C_{DL,supp}$ averaged over the area must then be corrected using the daytime and night-time hours in accordance with DIN V 18599-10, Annex A, as follows:

$$H_{use,rel} = C_{DL,sup} \frac{t(day)}{t(day)+t(night)}$$

[1] Alternative: ISO 52000-1 module 9 (M9) or the local EPC may be applied

where:
$H_{use,rel}$ = relative annual useful exposure according to the DIN 5034
$C_{DL,sup}$ = daylight supply factor according to the DIN 18599-4
t(day) = annual daytime use hours according to the DIN 18599-4
t(night) = annual nighttime use hours according to the DIN 18599-4

For this correction, the annual hours of use for daytime and night-time in accordance with DIN V 18599-10, Annex A, must be used, which is calculated for the site of the project as well as for the expected use times (= normal working hours, e.g. office work days from 7 am–6 pm) in accordance with DIN V 18599-10, Annex A. The annual relative useful exposure $H_{Mot,rel}$ determined in this way forms the basis for evaluation of this indicator.

Daylight simulation
When using daylight simulations to assess the relative annual useful exposure, it is not necessary to simulate all rooms within UA; it is sufficient to simulate a few representative rooms and apply the results to the remaining rooms in UA via appropriate interpolation.

Indicator 3: Visual contact with the outside
Proof of the minimum window area proportions in accordance with DIN 5034 must be documented using suitable plans and descriptions.
In accordance with DIN EN 14501, Table 10, the assessment of the class (0 to 4) of the solar radiation/glare protection with regard to visual contact with the outside is based on the vertical-vertical light transmittance $\tau_{v,n\text{-}n}$ and the proportion of the light transmittance that is diffused $\tau_{v,n\text{-}dif}$:

DIN EN 14501 Table 10 Visual contact with the outside – Classification			
$\tau_{v,\,n\text{-}n}$	$\tau_{v,\,n\text{-}dif}$		
	$0 < \tau_{v,n\text{-}dif} \leq 0.04$	$0.04 < \tau_{v,n\text{-}dif} \leq 0.15$	$\tau_{v,n\text{-}dif} \leq 0.15$
$\tau_{v,n\text{-}n} > 0.10$	4	3	2
$0.05 < \tau_{v,n\text{-}n} \leq 0.10$	3	2	1
$\tau_{v,n\text{-}n} \leq 0.05$	2	1	0
$\tau_{v,n\text{-}n} = 0.00$	0	0	0

If the solar radiation/glare protection is implemented with horizontal slats, the following angles must be used as a basis for the assessment of light transmittances:

- Normal angle of incidence of sunlight (same as for screens)
- Angle of inclination of moveable slats: max. opening angle (horizontal)
- Angle of inclination of fixed slats: as installed

If the solar radiation/glare protection is implemented with vertical slats, the following angles must be used as a basis for assessment of the light transmittances:

- Normal angle of incidence of sunlight (same as for screens)
- Angle of rotation of rotatable slats: max. opening angle (vertical)
- Angle of rotation of fixed slats: as installed

Indicator 4: Absence of glare in daylight

In accordance with DIN EN 14501, Table 8, the assessment of the class (0 to 4) of the solar radiation/glare protection with regard to absence of glare in daylight is based on the vertical-vertical light transmittance $\tau_{v,n\text{-}n}$ and the proportion of the light transmittance that is diffused $\tau_{v,n\text{-}dif}$:

DIN EN 14501 Table 8 – Glare control – Classification				
$\tau_{v,n\text{-}n}$	$\tau_{v,n\text{-}dif}$			
	$\tau_{v,n\text{-}dif} \leq 0.02$	$0.02 < \tau_{v,n\text{-}dif} \leq 0.04$	$0.04 < \tau_{v,n\text{-}dif} \leq 0.08$	$\tau_{v,n\text{-}dif} > 0.08$
$\tau_{v,n\text{-}n} > 0.10$	0	0	0	0
$0.05 < \tau_{v,n\text{-}n} \leq 0.10$	1	1	0	0
$\tau_{v,n\text{-}n} \leq 0.05$	3	2	1	1
$\tau_{v,n\text{-}n} = 0.00$	4	3	2	2

If the solar radiation/glare protection is implemented in the form of horizontal slats, the following angles must be used as a basis for assessment of the light transmittances:

- Normal angle of incidence of sunlight (same as for screens)
- Angle of inclination of moveable slats: max. closing angle (approx. 70° to 75°)
- Angle of inclination of fixed slats: as installed

If the solar radiation/glare protection is implemented in the form of vertical slats, the following angles must be used as a basis for assessment of the light transmittances:

- Normal angle of incidence of sunlight (same as for screens)
- Angle of rotation of rotatable slats: max. closing angle

- Angle of rotation of fixed slats: as installed

Indicator 5: Absence of glare in artificial light
The following methods are permitted for documenting the colour rendering:

(2) Artificial light simulation
The UGR value must be calculated using artificial light simulations and evaluated in accordance with DIN EN 12464-1 for selected, representative rooms.

(3) Product data sheets with UGR values
Documentation of the glare limitation in accordance with DIN EN 12464-1 via product data sheets with UGR values

Indicator 6: Colour rendering
The following methods are permitted for documenting the colour rendering:

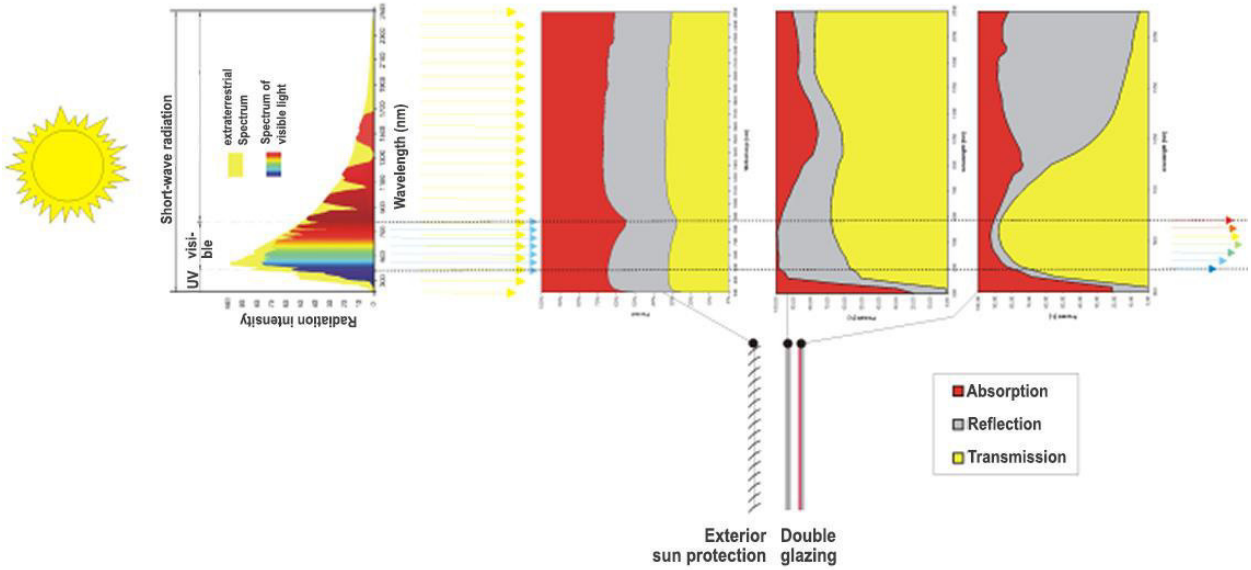
(4) Daylight
The colour rendering in daylight must always be evaluated for the combination of glazing and solar radiation/glare protection in accordance with DIN EN 14501. To do so, the general colour rendering index Ra for the combination of glazing and solar radiation/glare protection must be determined using spectral calculations in accordance with the method provided in DIN EN 410 and used as a basis for the evaluation.
The following points must be taken into account in the spectral calculations:

I. If the solar radiation protection also acts as the glare protection function when operated, it is sufficient to just determine and evaluate the colour rendering index Ra for the combination of the glazing and the solar radiation protection.

II. If there is no solar radiation protection in place but glare protection is installed, the colour rendering index Ra for the combination of the glazing and the glare protection must be determined and evaluated.

III. If the solar radiation protection does not act as the glare protection function when operated (e.g. if perforated slats are used), the colour rendering index Ra must be determined and evaluated for the combination of glazing, solar radiation protection and glare protection (if installed).

Colour rendering for multi-pane glazing



Spectral filtering of the light as it passes through the façade:
Higher transmission of the green/yellow portion of the daylight results in colour distortion into green/yellow light → reduction in the R_a.

(5) Artificial light

The colour rendering of artificial light must be verified using the manufacturer specifications for lighting.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements In accordance with Appendix 2: "Permitted documentation processes"

Indicator 1: Availability of daylight for the entire building

- Basis and results of the completed daylight simulation.
- Measurement report for the completed daylight measurements.
- Calculation using the simplified method of DIN V 18599-4 additionally for **Assembly buildings:**
- List of areas (usage areas 1-7 according to DIN 277-1, 2016-01) with allocation and explanation of any areas not considered
- Alternative to DIN 18599-4: ISO 52000-1 M9 or the local EPC calculation

Indicator 2: Availability of daylight at permanent workstations

- Basis and results of the completed daylight simulation.
- Calculation using the simplified method of DIN V 18599-4.
- Alternative: ISO 52000-1 M9 or the local EPC calculation
- In the case of corridors with panelling and different artificial lighting that renders it unable to be converted into workstations, clear and comprehensive documentation must be compiled, e.g. using photos, detailed plans and lighting concepts, additionally for **Assembly buildings:**
- List of areas including area allocations for type I and II incl. the area-weighted assessment explanation or clarification of areas that may not be considered.

Indicator 3: Visual contact with the outside

- Documentation of the visual contact with the outside (where applicable in accordance with DIN 5034-1, Section 4.2.3 or 4.2.2) using suitable plans and calculations.
- Data sheets for the installed solar radiation/glare protection systems.
- Photo documentation.

Indicator 4: Absence of glare in daylight

- Classification of the installed solar radiation/glare protection.
- Data sheets for the installed solar radiation/glare protection additionally for **Assembly buildings:**
- Area list including area allocation type I and II and presentation of the area-weighted assessment

Indicator 5: Artificial light

- Basis and results of the completed artificial light calculation.
- Product data sheets with colour rendering.

- Spectral measurement of the light composition.
- Area configuration for area-weighted evaluation.

Indicator 6: Daylight colour rendering

- Basis and results of the spectral calculation in accordance with DIN EN 410 or DIN EN 13363-2.
- MaUAacturer specifications for the glazing and solar radiation/glare protection system used, e.g. in the form of data sheets or calculation results.
- Data in accordance with DIN EN 14501, maUAacturer specifications or calculation (e.g. via software).

Indicator 7: Exposure to daylight

- Documentation of at least one guest room/living space.
- Floor plans, cross-sections, site plan.
- Sun progression chart.
- Calculation of the duration of exposure to daylight.

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
all	General, Evaluation and Usage specific explanation: scheme “Assembly buildings” has been added	16.09.2021
all	Editorial amendments for more clarification.	16.09.2021
all	Appendix 1: relevant UAs for the scheme “Assembly buildings” has been added	16.09.2021
403	Indicator 6: Typing error – 3 missed schemes have been added	

II. Literature

- DIN V 18599 Part 4. Energy efficiency of buildings. Berlin: Beuth Verlag. December 2012
- DIN 5034 Part 1. Daylight in interiors. Berlin: Beuth Verlag. July 2011
- DIN 5034 Part 2. Daylight in interiors. Berlin: Beuth Verlag. February 1985
- DIN 5034 Part 3. Daylight in interiors. Berlin: Beuth Verlag. February 2007
- DIN EN 12464 Part 1. Lighting of work places. Berlin: Beuth Verlag. August 2008
- DIN EN 13363 Part 2: Solar protection devices combined with glazing – Calculation of total solar energy transmittance and light transmittance – Part 2: Detailed calculation method; German version EN 13363-2:2005. Berlin: Beuth Verlag. June 2005 incl. DIN EN 13363-2 Corrigendum 1 published April 2007
- German workplace regulation (ArbStättV). 12.08.2004; last changed 19th July 2010
- VDI 6011: Optimisation of daylight use and artificial lighting. Düsseldorf: Verein Deutscher Ingenieure e.V.
- DIN 6169: Colour rendering. Berlin: Beuth Verlag. February 1976

SOC1.5

User control

Objective

Our objective is to achieve a high level of user satisfaction in the interior of a building.
This is why occupants should be provided with the best possible options to control the indoor climate. Aside from the actual conditions in the building, users' satisfaction also depends on the ability to adjust ventilation, shading and glare protection, temperature and lighting to their individual preferences, beyond the standard settings.

Benefits

Measures which allow occupants to exert the greatest possible influence on the indoor climate increase comfort in a building, which in turn, improve comfort and contribute to greater satisfaction and productivity.

Contribution to overriding sustainability goals

No direct contribution to Sustainable Development Goals (SDGs) of United Nations (UN).

Outlook

Thanks to digital solutions, technology is becoming ever more sophisticated and increasingly tailored to individual needs. It is not necessary to specify concrete solutions in order to achieve points. Instead, designers are encouraged to concentrate more closely on addressing the objectives of the criterion in the context of their project. There are currently no plans to focus more heavily on this objective.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Hotel**	**2.0%**	**2**
Education	**1.8%**	**2**
Residential	**2.1%**	**2**
Consumer market **Shopping centre** **Department stores**	**2.3%**	**2**
Logistics **Production** **Assembly buildings**	**0.0%**	**0**

EVALUATION

Individual control of ventilation, shading and glare protection, temperature during and outside of heating period, and artificial lighting will be reflected positively in the evaluation by awarding points under the five corresponding indicators. Measures for increasing user control that fall outside of this scope can be credited individually and based on the context of using the innovation area indicator (indicator 6). In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**Ventilation**	
1.1	**Ventilation control**	
	Office	**Max. 25**
	■ Air exchange for a particular room can be controlled in that room	15
	■ Air exchange can be controlled individually by the users or user group (1 to 3 people)	25
	Education	
	■ Indoor air quality of a particular room can be controlled as required	**20**
	Residential	**Max. 35**
	■ Air exchange for a particular room can be controlled in that room	18
	■ Indoor air quality of a particular room can be controlled as required using individual adjustment means	30
	■ Indoor air quality of a particular room can be controlled as required using individual adjustment means on a central control system/smartphone	35
	Consumer market **Shopping centre** **Department stores**	
	■ The ventilation of shops in the premises can be individually controlled by a shop employee. The minimum level of ventilation is specified according to demand.	**25**
	Hotel	**Max. 20**
	■ Air exchange for a particular room can be controlled	15
	■ Air exchange for a particular room can be controlled; ventilation is switched off automatically when windows/balcony doors are opened	20
2	**Shading and glare protection**	
2.1	**Shading and glare protection control**	
	Office	**Max. 30**
	■ Shading or glare protection can be controlled in the room	10
	■ Shading or glare protection can be controlled by the users or user group (1 to 3 people)	20
	■ Shading and glare protection can be controlled by the users or user group (1 to 3 people)	30

Education		**Max. 25**
	■ Shading for a particular room can be controlled in that room	15
	■ Shading or glare protection can be controlled by the users or user group (1 to 3 people)	20
	■ Shading and glare protection can be controlled by the users or user group (1 to 3 people)	25
Hotel		
	■ Shading or glare protection for a particular room can be controlled	**20**

3 Temperatures during the heating period

3.1 Room temperature control during the heating period

Office		**Max. 15**
	■ Temperature can be adjusted in the room	8
	■ Temperature can be adjusted individually by the users or user group (1 to 3 people)	15
Education		
	■ Temperature can be adjusted in the room	**15**
Residential		**Max. 30**
	■ Temperature can be adjusted for every living space	25
	■ Temperature can be adjusted for every living space by means of a central control system/smartphone	30
Consumer market **Shopping centre** **Department stores**		**Max. 25**
	■ The building has a (heating) system which tenants in all shops can connect their heating installations to.	15
	■ Connection to a system in the building allows the sales manager to adjust the room temperature individually.	25
Hotel		
	■ Temperature of a particular room can be adjusted	**20**

4 Temperatures outside of the heating period (cooling)

4.1 Temperature control outside of the heating period

Office		**Max. 15**
	■ Temperature can be adjusted in the room	8
	■ Temperature can be adjusted individually by the users or user group (1 to 3 people)	15
Education		
	■ Temperature can be adjusted in the room	**15**

Residential	**Max. 35**
■ Temperature of a particular dwelling can be adjusted	15
■ Temperature can be adjusted for every living space	30
■ Temperature can be adjusted for every living space by means of a central control system/smartphone	35
Consumer market **Shopping centre** **Department stores**	**Max. 50**
■ The building has a (cooling) system which tenants in all shops can connect their cooling installations to.	40
■ Connection to a system in the building allows the sales manager to individually adjust the room temperature.	50
Hotel	
■ The temperature of a particular room can be adjusted	**20**

5 Artificial light control

5.1 Artificial light control

Office	**Max. 15**
■ Artificial light can be adjusted in the room	5
■ Artificial light can be controlled individually by the users or user group (2 to 3 people)	10
■ Artificial light can be controlled individually by a user	15
Education	**Max. 25**
■ Daylight and artificial light of a particular room can be controlled	15
■ Artificial light can be controlled individually by the users or user group (2 to 3 people)	25
Hotel	
■ Artificial light within a room can be controlled by zones	**20**

6 INNOVATION AREA

As in 1.1–5.1

Explanation: If user control means are implemented but cannot be assigned to any of the above categories or measures even though they demonstrably improve users' comfort or well-being, these can be credited in accordance with the evaluation scheme for indicators 1.1–5.1.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Ventilation can be controlled individually for a particular room or by the users/user groups. Note: KPI can be used for the level(s) reporting indicator 4.1 "Indoor air quality" (Level 1).	Yes/No
KPI 2	Shading and/or glare protection can be controlled individually for a particular room or by the users/user groups. Note: KPI can be used for the level(s) reporting indicator 4.3 "Lighting and visual comfort" (Level 1).	Yes/No
KPI 3	Room temperatures (during heating period) can be controlled individually for a particular room or by the users/user groups.	Yes/No
KPI 4	Room temperatures (outside of the heating period) can be controlled individually for a particular room or by the users/user groups.	Yes/No
KPI 5	Artificial light can be controlled individually for a particular room or by the users/user groups.	Yes/No

Synergies with DGNB system applications

- **DGNB BUILDING IN USE:** Satisfying high standards in this criterion will highly likely result in high satisfaction rates when the building is in use. This is in line with criterion 9.1 from the scheme for buildings in use.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

User productivity and satisfaction as well as energy consumption in the building are closely linked to the users' ability to individually control the indoor climate. Important factors in maximising acceptance of the indoor climate are thermal comfort, indoor air quality, noise level and lighting.

II. Additional explanation

–

III. Method

Documentary evidence for all indicators in this criterion must be provided for 80% of the rooms allocated to the primary use of the building (for **Hotel** guest rooms and administration).
Compliance with local legal requirements is a basic prerequisite for the evaluation of this criterion.

Indicator 1: Ventilation
Air exchange ensures that users benefit from an adequate supply of fresh air. Rooms can be supplied with fresh air by window ventilation or by means of controlled ventilation by room ventilation systems. If the user can control either the mechanical or natural ventilation, this will be reflected positively in the evaluation.

Office **Consumer market** **Shopping centre** **Department stores**
For the evaluation in a room with natural ventilation, up to three workstations may be assigned, in principle, to a nearby openable window (distance of approx. 5–8 m).

Indicator 2: Shading/ glare protection
The purpose of shading is to prevent the building from overheating by absorption (e.g. through the use of cantilevered element) or by reflection (e.g. through the use of external blinds). Ideally, window surfaces should be shaded completely. Features which provide user control include awnings, venetian blinds, adjustable louvres, mobile sheets of perforated metal, folding blinds and other similar items which can be influenced by the user. Solar glazing and fixed elements cannot be influenced by the user and will not be recognised in the evaluation. Solar protection must be provided on the outside of the building or between the layers of multiple glazing panels. The wavelengths of permissible energy transmission values should be between g = 300 nm and g = 2500 nm. Explicit evidence must be provided for alternative shading measures.

The purpose of glare protection is to ensure the equal distribution of light within a room and create a diffused lighting scheme, which allows for glare-free work. Examples of suitable glare protection include curtains, roman blinds, roller blinds, and vertical blinds installed in the interior. External venetian blinds do not provide adequate glare protection. Explicit evidence must be provided for alternative glare protection measures.

Indicator 3: Temperatures during the heating period
Occupants should benefit from opportunities to influence the temperature in rooms or in zones within the room. Simply opening the windows does not qualify, because it does not provide occupants with the opportunity to actively influence the temperature. Hence this indicator specifically looks for (active) temperature control.

Indicator 4: Temperatures outside of the heating period (cooling)
Active cooling is required for the purposes of the evaluation. Alternatively, if the choice of passive systems achieves a cooling effect that allows for individual adjustments to the indoor climate for groups of people or rooms, this can also be credited.

Indicator 5: Artificial light control
Depending on the situation, occupants should be provided with the opportunity to reduce daylight or enhance it with artificial lighting (restricted to brightness and no other artificial lighting qualities).

IV. Usage-specific description

This criterion does not apply to the schemes **Logistics** **Production buildings**

The following indicators do not apply in the schemes **Residential** **Consumer market** **Shopping centre** **Department stores**:

Indicator 2: Shading / glare protection
Indicator 5: Artificial light control

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1: Ventilation

- Excerpt from the ventilation concept for the building, outlining the essential features of the design and detailing fundamental assumptions regarding the building and the energy consumption for air conditioning in accordance with DIN V 18599 or local requirements.
- Documentation of the spatial allocation of the windows to workstations

Indicator 2: Shading / glare protection

- Information on shading system, e.g. in the form of data sheets from the manufacturer
- Description of the shading system, listing products and manufacturers and providing information on the type and extent of control possibilities
- Information on glare protection, e.g. in the form of data sheets from the manufacturer
- Description of the glare protection system, listing products and manufacturers and providing information on the type and extent of control possibilities

Indicator 3: Temperatures during the heating period

- Information on the heating system, e.g. in the form of data sheets from the manufacturer
- Detailed heating concept with information on the components installed, the control system and the relevant parameters, e.g. system temperatures
- Documentation detailing how a heating system is controlled and the extent of the area that the user has control over (i.e. control by zone or by room)
- Documentary evidence of the control options available to the user, e.g. in the form of photo documentation

Indicator 4: Temperatures outside of the heating period (cooling)

- Information on the cooling/air-conditioning system, e.g. in the form of data sheets from the manufacturer
- Detailed cooling/air-conditioning concept with information on the components installed, the control system and the relevant parameters, e.g. system temperatures

Indicator 5: Artificial light control

- List of products used and manufacturers engaged for illuminating the office workstations and workspaces, e.g. in the form of data sheets from the manufacturers
- If different fittings are used for different workstations or workspaces, all fitting types must be documented and included in the evaluation.

APPENDIX C – LITERATURE

I. Version

Change log based on Version 2018

PAGE	EXPLANATION	DATE
436	General: scheme “Assembly buildings” has been added	16.09.2021
441	KPI update according to the Level(s) latest amendments	16.09.2021

II. Literature

- DIN V 18599. Energy efficiency of buildings - Calculation of the net, final and primary energy demand for heating, cooling, ventilation, domestic hot water and lighting - Part 1: General balancing procedures, terms and definitions, zoning and evaluation of energy sources. Berlin: Beuth publisher. October 2016.
- DIN V 18599. Energy efficiency of buildings - Calculation of the net, final and primary energy demand for heating, cooling, ventilation, domestic hot water and lighting - Part 3: Net energy demand for air conditioning. Berlin: Beuth publisher. October 2016.

SOC1.6

Quality of indoor and outdoor spaces

Objective

Our objective is to provide building users with high-quality indoor and outdoor spaces that accommodate as wide a variety of recreational and functional uses as possible and increase the sustainability of the property and the comfort of all users for a long time to come.

Benefits

Buildings with high-quality spaces boost the health and happiness of their users and residents, and promote social interaction. This significantly improves the building's utility value.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)	CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Low		4.2.a/b	Provisions for families

Outlook

This criterion assesses the quality of spaces both inside and outside the building. In practical terms, serious deliberations are under way regarding the extent to which the quality of spaces should remain in a criterion in the future for the purposes of assessment, or whether it would be advisable to assess indoor and outdoor spaces separately.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Hotel** **Assembly buildings**	**2.0%**	**2**
Education	**1.8%**	**2**
Residential	**2.1%**	**2**
Consumer market **Shopping centre** **Department stores**	**2.3%**	**2**
Logistics **Production**	**5.4%**	**5**

EVALUATION

This criterion assesses how the quality of spaces is to be evaluated. The topics addressed are as follows: spaces designed to facilitate communication, additional provisions for users, family-friendly, child-friendly and senior- friendly design, interior access and circulation areas, design of the outdoor space, outdoor areas and fixtures and equipment. The amount of possible points adds up to more than 100 points; however, there is a maximum of 100 points that can be awarded in this criterion.

NO.	INDICATOR	POINTS
1	**Indoor spaces to facilitate communication**	
1.1	**Communication zones of primary use**	**Max. 15**
	■ Various communication zones, e.g. open meeting areas or meeting zones, conditioned atria and inner courtyards, alcoves as meeting points. For **Residential:** In residential buildings, primarily communal facilities and communication zones, e.g. seating, common rooms, multipurpose rooms as part of the units. For **Shopping centre** **Assembly buildings:** there are primarily flexible and versatile internal activity areas available.	+10
	■ Interior design that facilitates and promotes communication, e.g. by means of glass door and wall elements: transparency allowing a direct view of multiple rooms (e.g. learning areas, recreation rooms).	+5
Re 1	**INNOVATION AREA** **Forward-thinking space concepts**: Rooms or zones that facilitate or promote communication by means of tailored solutions. Space concept for innovative living, working, residential, teaching and learning environments that offers a wide range of different uses and fulfils the needs and requirements of the residents/staff/users/guests and the activities that take place within the building, and affords optimal flexibility and economic viability (e.g. a lounge for creative work, provisions for demand-based residential, supply, service and amenity concepts, technology-based services to assist elderly people with their day-to-day life, "networked living", desk sharing, open spaces for educational concepts with open teaching formats, etc.). ■ For each innovative communication configuration (in accordance with the indicators under 1.1)	**As in 1.1**
2	**Additional provisions for users**	
2.1	**Additional provisions/services**	**Max. 15**
	■ Additional provisions, multipurpose rooms or common rooms, e.g. cafeteria, gym, library, spa, sauna	+10
	Also in **Shopping centre** **Consumer market** **Assembly buildings;**	
	■ Lockers as storage and / or garderobes for customers and / or visitors	
	Also in **Residential**:	
	■ Common rooms are accessible to all users	

- Combination of extensive washing and/or drying areas as communal areas promoting communication – in residential buildings, this may mean not having connection points for washing machines in dwellings.

2.2 **Navigation/information**

- Navigation system (e.g. signage, information boards/columns), +5
- Presence of an information desk that is integrated into the overall interior design concept and is manned by a member of staff (during the opening/certain hours), e.g. in shopping centres, consumer markets, large housing developments, office complexes, etc.

Re 2 **INNOVATION AREA** — **As in 2.1 and 2.2**

Alternative, tailored solutions that constitute additional provisions for users or assist with navigation/provide information, e.g. cradle-to-cradle concept for innovative communal washing machine use and management.

- For each solution (in accordance with the indicators under 2.1 and 2.2)

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3 Family-friendly, child-friendly and senior-friendly design

3.1 **Provisions for families in the building** — **Max. 20**

- Childcare facilities +5
- Rooms with baby changing facilities and separate breastfeeding rooms/areas (tailored to the individual scheme) +5
- Children's play areas (without childcare) +5
- Senior citizens' recreation and entertainment areas (e.g. areas for playing parlour games) +5
- Parking areas include a number of designated parking spaces for families, with dimensions to accommodate the additional needs of families (width ≥ 2.7 m), that allow the vehicle to be easily loaded and unloaded **+5**

Also in: **Hotel**

- At least 5% of the rooms are family-friendly and feature a baby changing table, children's bed, facilities for preparing food and blackout roller blind. (At least three of these features should be provided). +5

Re 3 **INNOVATION AREA** — **As in 3.1**

Explanation: Innovative, bespoke solutions with a family-friendly design.

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4 Quality of interior access and circulation areas — **Max. 10**

4.1 **Quality of interior access and circulation areas**

The following or similar features have been provided in the access and circulation areas:

- Areas that open out, galleries, alcoves, stairways that are sufficiently wide and offer sufficient open space vertically to allow communication between people on different storeys, entrance stairways, seating (e.g. suitable projecting elements, steps, benches and similar).
- Daylight shines into the access and circulation areas.
- Doorways opening into exterior spaces, e.g. balconies, roof terraces, atria,

etc., are provided.

- Access and circulation areas have stricter thermal, acoustic or soundproofing requirements to allow for flexible use of these areas.

Number of features provided:

- 3 — 5
- ≥ 5 — 10

Re 4 **INNOVATION AREA** — **As in 4.1**

Explanation: Innovative, tailored solutions that transform access and circulation areas into pleasant spaces that fit their purpose.

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5 Outdoor facility design concept

5.1 Design concept for the outdoor facilities — Max. 20

5.1.1 The design concept integrates the clever use of materials, lighting, navigation, greening and the necessary technical installations, or there is a design guide with an outdoor facility programme that has been implemented in all the outdoor spaces (open space plan, conceptual models and building specifications, and possibly also additional, detailed plans). — +10

5.1.2 Quality of outdoor areas

- Connecting building areas with the goal of creating social spaces and building a sense of community — +5
- Playgrounds with high-quality equipment — +5
- Green spaces and parks that are easily accessible — +5
- Technical infrastructure that is part of the user experience, e.g. visible, aesthetically pleasing water circulation systems — +5
- Auxiliary facilities are integrated into the design (waste disposal sites, bicycle storage facilities, underground garage ventilation, etc.) — +5
- Social control of outdoor areas is afforded by means of linkages between the building and the outdoor space — +5

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6 Outdoor areas

6.1 Roof surfaces — Max. 25

- > 10% of the roof surface areas (but at least 5 m² of usable area) are outdoor spaces available to the building users — +5

In: **Shopping centre** **Logistics** **Production** **Assembly buildings**

- > 1% of the roof surface area

6.2 Façade

- Balconies, loggias or conservatories with at least 3 m² of usable area per unit — +5
- Façade greening over > 10% but at least 20 m² in total — +5

6.3 **Outdoor space (ground level)**

- Communal outdoor seating areas or terraces, atrium (not conditioned) or inner courtyard with spaces where users from all over the building can spend time +10
- At least 80% of all classrooms and other rooms in a building have doors that provide access to the outdoors, allowing the adjacent outdoor areas/roof surfaces to be used +10

Re 6 **INNOVATION AREA** **As in 6.1–6.3**

Explanation: Innovative, tailored solutions that allow the building's users to use the outdoor area.

- For each solution (in accordance with the indicators under 6.1 till 6.3)

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7 Fixtures and equipment

7.1 **Fixtures and equipment in the usable outdoor areas** **Max. 10**

- Fixed seating and/or loungers
- Movable seating and/or loungers
- Weatherproof outdoor furniture for lunch breaks, including tables and chairs
- Power supply for outdoor workstations and workspaces
- Fixed fitness and exercise equipment
- Open green spaces that people can spend recreation time in
- Water features
- Shelter that protects against weather
- Wind protection measures
- Protection from the summer sun in the form of trees or fixed, rigid or movable shading systems
- Other fixtures or equipment that increases comfort for the user groups in outdoor areas

Number of features provided:

- 3 5
- ≥ 5 10

Re 7 **INNOVATION AREA** **As in 7.1**

Explanation: Innovative, tailored solutions that increase comfort of the building users or user groups using the outdoor area.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The provisions that promote communication, the provisions for users, and the facilities for families, children and senior citizens are good key performance indicators (KPIs) to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Number of provisions designed to promote communication	[number]
KPI 2	Number of additional provisions for users	[number]
KPI 3	Number of facilities for families, children and senior citizens	[number]

Synergies with DGNB system applications

- **DGNB BUILDING IN USE:** High synergies with criterion SOC9.2 from the scheme for buildings in use.
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion SOC1.6 from the scheme for renovated buildings.
- **DGNB INTERIORS:** High synergies with criterion SOC1.6 from the scheme for interiors.
- **DGNB DISTRICTS:** Indicators 5, 6 and 7 correspond to the content of indicator SOC1.6.2 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Outdoor spaces in the immediate vicinity of the building improve the general well-being of the building users, offer alternative places to work and enjoy breaks in, promote interaction between users and increase general acceptance of the building. Depending on the design of the outdoor areas, they may help improve both the urban landscape and the local environment.

II. Additional explanation

In addition to representative and design aspects, indoor and outdoor spaces can increase the comfort of all users (tenants/owners and/or external users). Functional areas must first and foremost be designed with users' well-being in mind. These areas offer the opportunity to provide places for recreation, to communicate with others and to recuperate.

III. Method

The quality of spaces is described by means of qualitative and quantitative indicators. The number and quality of the outdoor and indoor areas are assessed.

Indicator 1: Indoor areas to facilitate communication
Indicator 1.1: Communication zones of primary use
Examples of possible communal facilities and communication zones include open meeting rooms, conditioned atria and inner courtyards, expanded corridor areas, break areas and kitchenettes that offer a variety of seating.

Indicator 2: Additional provisions for users
Additional provisions can fulfil various functions, such as offering amenities or leisure facilities or extending facilities for specific uses. They may also extend the usage times of a building as part of the day/night cycle, which additionally may have the effect of helping to enliven the immediate local area. Additional provisions for users could be a cafeteria/canteen, gym, sauna, library, music room, living and workspaces available for hire or rent, guest accommodation, multipurpose rooms, common rooms, work rooms, extensive washing and drying rooms, and other similar provisions, that complement the main use of the building.
Navigation and information systems are also important elements for usage.

Indicator 3: Family-friendly, child-friendly and senior-friendly design
Besides social provisions, family-friendly structures within the building are another important characteristic that can be used to describe and evaluate a property. Depending on the particular use, these include, for example, childcare facilities or the provision of a company day nursery or crèche or children's play areas. Rooms with baby changing and breastfeeding facilities can also contribute to fulfilling the needs of users with young children within a building.

Indicator 4: Sojourn Quality (of the interior access and circulation areas)
Access and circulation areas should be well lit and large enough to accommodate the required use and a variety of purposes. This informal use of access and circulation areas, for example for communication, taking a break or other

activities, is a growing trend. The perception of space by navigation and communication, for example, is enhanced by visual linkages of the indoors and outdoors, as well as across floors. Attractive views increase the sojourn quality.

Indicator 5: Outdoor facility design concept – Quality of outdoor areas
The design concept integrates the clever use of materials, lighting, navigation, greening and the necessary technical installations, or there is a guide for designing private open spaces, which respects the individual design wishes of the residents, but also provides a framework for coherent area design. It contains information on the outdoor facility programme for all the outdoor areas (open space plan, conceptual models and building specifications, and possibly also additional detailed plans).

Indicator 6: Outdoor areas
The evaluation takes into consideration roof surfaces (roof terraces, roof gardens, greenhouses, etc.), the façade (façade elements, balconies, loggias, conservatories, etc.) and the ground-level outdoor space (atria, inner courtyards, outdoor seating areas, terraces, etc.). These open spaces should both maximise exposure to sunlight in the winter and provide adequate shading in the summer.
When evaluating the façade greening, the total coverage of the façade with greenery is taken into account. The planned coverage is the key factor here. A growth guarantee of at least two years should be contractually agreed.

Indicator 7: Fixtures and equipment (in the usable outdoor areas)
With regard to the design of the outdoor spaces, a variety of fixtures and equipment should be provided. The evaluation is based on how many of these elements have been provided.

IV. Usage-specific description

-

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements. The data used must be up-to-date or, if relatively old documents/content are/is used, they must demonstrate that they continue to be applicable.

1. Indoors

   - Excerpts from the floor plans and sections, including spatial and functional allocation, and furnishings if appropriate
   - Photo documentation
   - Interior design concept for forward-thinking office design (flexibility and economic viability form part of the concept)
   - Every aspect of the areas being assessed must be documented using photographs/views/sections/floor plans and a statement regarding their positive effect in accordance with the requirements of the indicator

2. Outdoors

   - Open space plan (possibly with detailed plans)
   - Outdoor space design concept (with conceptual description or sketches)
   - Plan view of the roof surfaces with information regarding the proportion used for technical installations, rooftop greenery, material and colour choice for the roofing and the usable areas
   - Roof surface design concept
   - Views of the building that show its design
   - Site plan
   - Three-dimensional visualisation (renderings, model photographs, drawings)
   - Every aspect of the areas being assessed must be documented using photographs/views/sections/floor plans and a statement regarding their positive effect in accordance with the requirements of the indicator

APPENDIX C – LITERATURE

I. Version

Change log based on 2018 version

PAGE	EXPLANATION	DATE
all	General and Evaluation: scheme “Assembly buildings” has been added	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

SOC1.7

Safety and security

Objective

Our objective is to devise a design concept that prevents dangerous situations in buildings and their immediate vicinity as much as possible.

Benefits

A high sense of security makes a vital contribution to people´s comfort. By contrast, uncertainty and anxiety restrict freedom of movement. Measures which increase the sense of security also generally help with reducing the possibility of being assaulted.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Low	11.7	Provide access to safe and inclusive green and public spaces	16.1	Crime

Outlook

Hazardous incident risks are also part of the safety and security topic. This topic may thus be added to this criterion in a later version.

Share of total score

	SHARE	WEIGHTING FACTOR
Office	**1.0%**	**1**
Education	**1.8%**	**2**
Hotel **Assembly buildings**	**2.0%**	**2**
Residential **Consumer market**	**1.1%**	**1**
Shopping centre **Department stores**		
Logistics **Production**	**4.3%**	**4**

EVALUATION

The type and scope of building measures required in order to increase people's sense of security and to prevent dangerous situations in buildings and their immediate vicinity are assessed using indicator 1. Safety measures that fall outside of the scope of the proposed topics can be credited as alternative under the innovation area indicator. In this criterion, a maximum of 100 points can be attained.

NO.	INDICATOR	POINTS
1	**Subjective perception of safety and protection against assault**	
1.1	**Level of visibility** General areas (entrance areas, main thoroughfares, inner courtyard paths) and underground garages, ground-level car parks and multi-storey or rooftop car parks (where available) offer clear visibility.	**40**
1.2	**Level of lighting** Main thoroughfares, paths to car parks and bicycle parking areas are well lit.	**30**
1.3	**Technical safety equipment** **Office** **Education** **Hotel** **Consumer market** **Shopping centre** **Department stores**	**Max. 30**
	Logistics **Production** **Assembly buildings**	
	Residential	**Max. 20**
	Number of technical safety installations (emergency telephones, CCTV, PA systems (in offices), voice alarm systems or comparable installations):	
	■ 1	15
	Residential	10
	■ ≥ 2	30
	Residential	20
1.4	**Preventive safety measures** **Residential** Measures to prevent burglaries, e.g. roller shutters on the lower storeys, alarm system, RC protection class.	**10**
	Does not apply to **Office** **Education** **Hotel** **Consumer market** **Shopping centre** **Department stores** **Assembly buildings** **Logistics** **Production**	
Re 1	**INNOVATION AREA** Explanation: Safety measures that cannot be assigned to any of the categories or measures listed above but demonstrably make people feel safer and more secure and protect them from assault	**As in 1.1–1.4**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The number of safety installations and measures provided are good key performance indicators (KPIs) to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Number of technical safety installations and preventive measures	[number]

Synergies with DGNB system applications

- **DGNB BUILDING IN USE:** There are synergies with criterion TEC9.1 from the scheme for buildings in use.
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion SOC1.7 from the scheme for renovated buildings.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Building measures can help increase people's perception of safety and prevent dangerous situations.

II. Additional explanation

Building users' subjective perception of safety can be raised, for example, by ensuring that there is adequate visibility and lighting in the outdoor areas, clear layout of paths, and by using technical safety equipment. These measures serve to prevent danger and reduce attacks and accidents.

III. Method

Indicator 1: Subjective perception of safety and protection against assault
A sense of safety, security and protection from assault should be increased using suitable measures. Indicators for this are as follows:

Indicator 1.1: Level of visibility
People's sense of safety and security on the site and within the building itself should be increased by improving visibility, comprehensive sign-posting. Open spaces and outdoor paths are assessed here. The evaluation takes into consideration the visibility in all general areas and rooms as well as the visual links between rooms and general areas, e.g. main thoroughfares, entrance areas, inner courtyards and an underground car parking design that affords clear visibility.

Indicator 1.2: Level of lighting
Well-lit main thoroughfares, publicly accessible outdoor spaces and the ability to reach destinations (bicycle parking areas, car parks, bus stops) directly without detours help increase people's sense of safety and security.

Indicator 1.3: Technical safety equipment
Technical safety equipment suggests that help is readily accessible and available in a dangerous situation. This feature gives users a feeling of increased safety while discouraging potential offenders. Technical safety equipment includes CCTV, emergency telephones and PA systems.

Only areas in which data protection laws will not be violated can be monitored using CCTV equipment.

Indicator 1.4: Preventive safety measures
Measures to prevent burglaries, e.g. roller shutters on the lower storeys, alarm systems or burglary-resistant doors/windows (rated using resistance classes (RC)) are evaluated here.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1: Subjective perception of safety and protection against assault
Indicator 1.1: Level of visibility

- Excerpt from the detailed design plans showing the visual relationship between rooms and general areas such as main thoroughfares, paths and roads, the entrance areas and inner courtyards and clear visibility of the underground car park.
- Written explanations of the plans
- Photo documentation

Indicator 1.2: Level of lighting

- Plan of the paths
- Lighting concept for the paths
- Documentary evidence demonstrating the light intensity (illuminance) or light densities (luminance), e.g. from data sheets for the lighting used or by measuring, simulating or calculating these values
- Documentation showing the location of the car parks, e.g. on the site plan or the underground car park plan
- Documentation showing the location of the bicycle parking areas, e.g. in the site plan or the underground car park plan

Indicator 1.3: Technical safety equipment

- List and documentary evidence of the technical safety installations present, e.g. through the functional specification created or contracts made
- Location of the technical safety installations, e.g. on plans
- Photo documentation of the safety installations that have been provided, specifying their location

Indicator 1.4: Preventive safety measures

- As in indicator 1.3

APPENDIX C – LITERATURE

I. Version

Change log based on 2018 version

PAGE	EXPLANATION	DATE
all	General and Evaluation: scheme “Assembly buildings” has been added	16.09.2021

II. Literature

- EN 12464-1. Light and lighting – Lighting of work places – Part 1: Indoor work places. Berlin: Beuth publisher. August 2011. http://www.ageta.lt/app/webroot/files/uploads/filemanager/File/info/EN_12464-1.pdf
- EN 12464-2. Light and lighting – Lighting of work places – Part 2: Outdoor work places. Berlin: Beuth publisher. October 2007. http://svstsv.com/assets/files/content/norms/bur/EN-12464-2.pdf
- Technical regulations for workplaces A3.4/3 Safety lighting [in German: ASR A3.4/3 Sicherheitsbeleuchtung]. May 2009. https://www.baua.de/EN/Topics/Work-design/Workplaces/Workplaces-ordinance/Workplaces-ordinance_node.html
- State building regulations
- Sustainable Development Goals, United Nations/globalgoals.org
- Risk maps (CEDIM Risk Explorer)

SOC2.1

Design for all

Objective

Our objective is to make the entire environment we build around ourselves accessible to everyone and without restrictions on its use, whatever their personal situation.

Benefits

If the principles of barrier-free building have already been incorporated when planning the building work, irrespective of whether there are currently people with disabilities or impairments using the building, this foresight will largely eliminate any costs that adapting the building would require, as well as the complication of the work that these modifications would involve. Barrier-free design makes buildings more attractive to all user groups, especially to people with impaired motor skills, sensory impairments and cognitive impairments. With the current change in demographics, people's differences should be celebrated as something that opens up possibilities.

Contribution to overriding sustainability goals

	CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF THE UNITED NATIONS (UN)	CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY
Significant	8.5 Appropriate work for all men, women, people with disabilities 10.2 Inclusivity facilitated 11.7 Access to public spaces and green spaces	
Moderate		10.2 Distributive justice

Outlook

The requirements for barrier-free design are not expected to become stricter in the future.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Assembly buildings**	**3.1%**	**3**
Education	**3.6%**	**4**
Residential	**4.3%**	**4**
Hotel	**2.9%**	**3**
Consumer market **Shopping centre** **Department stores**	**4.5%**	**4**
Logistics **Production**	**0.0%**	**0**

EVALUATION

The barrier-free design criterion is an exclusion criterion in the DGNB certification system (this does not apply to the New logistics buildings and New production buildings schemes). If a building does not fulfil the minimum requirements for barrier-free design, it cannot be awarded a certificate.

The criterion is evaluated in both qualitative and quantitative terms based on how well it fulfils barrier-free design requirements. The more areas of the building that are barrier-free and are accessible to and can be used by people with impaired motor skills, sensory impairments and/or cognitive impairments without significant difficulty and generally without requiring help from other people, the better the outcome of the evaluation for the building. For the scheme **Assembly buildings** there are only two quality levels.

For some schemes, additional points can be awarded within the quality levels. A maximum of 100 points can be awarded for this criterion.

NO.	INDICATOR	POINTS
1	**Quality level 1/DGNB minimum requirement**	
1.1	**Degree of barrier-free design**	
	Office **Education** **Residential** **Hotel** **Shopping centre**	**10**
	Department stores **Consumer market**	**Max. 20**
	Assembly buildings	**Max. 50**
	The requirements of the national building regulations with regard to barrier-free design have been fulfilled. The following has been implemented as a minimum: ▪ Internal and external infrastructure: Access routes to entrances, entrances and areas in which to manoeuvre in front of the entrance door(s) (and lift, if installed) and the associated circulation and secondary areas and general areas of the building that are important for the use are barrier-free in accordance with the ISO 21542:2021* [Accessibility and usability of the built environment], alternatively DIN 18040 can be used as a valid standard. ▪ Barrier-free infrastructure for all the units in the building, regardless of whether these are used by one or a number of different users. ▪ Dedicated circulation areas for disabled passenger car parking spaces ▪ Operating information (e.g. for entrance doors, lift) provided in line with the "multiple-sense principle" ("at-least-two-senses principle" – e.g. visual, audible, tactile). ▪ At least one barrier-free toilet cubicle can be accessed from a public area. Access is provided even where there are separate use areas in the building and is placed on an equal footing with other bathroom facilities in terms of its location (equal status for a barrier-free toilet cubicle on a basement storey is only achieved if, for example, other, standard toilet cubicles are also provided as part of the bathroom facilities and their furnishings match those in the over ground building area).	

* With an **exception** regarding the unobstructed door width: The minimum unobstructed width of a doorway(s), as well as entrance width of elevator(s) and barrier free toilet(s) must be at least 900 mm. All other recommendatory requirements in this standard must be considered as mandatory.

For **Residential**:

- Barrier-free bathroom facilities must be installed in barrier-free housing units accordingly.

For **Department stores** **Consumer market**:

- A barrier-free toilet cubicle must be provided in rented areas of Department stores, department stores and consumer markets with a sales area ≥ 3000 m².
- **Additional points for quality level 1:** A barrier-free toilet cubicle has been provided in rented areas of Department stores, department stores and consumer markets with a sales area < 3000 m². + 10

Also in **Department stores** **Consumer market** **Shopping centre**:

- Staff entrances have either been implemented in the form of dedicated barrier-free staff entrances or barrier-free access has been provided in the main entrance areas via the publicly accessible general areas (mall), provided that access to all units is barrier-free

Also in **Residential**:

- Barrier-free residential dwellings (2% from the total number of dwellings in the building, but at least 2 units) in accordance with the recommendations of the ISO 21542:2021 standard or DIN 18040-2
- General areas of the building (including the dwelling entrance doors) must be designed to allow for unrestricted use by people in wheelchairs (see the footnote above). This applies at least to the storeys with barrier-free dwellings.

Also in **Assembly buildings**

- A detailed overall concept for accessibility was created. At least all publicly accessible areas are "barrier-free" in accordance with ISO 21542:2021 or DIN 18040-1.
- Easily accessible, barrier-free sanitary rooms are arranged in all use areas.

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2 Quality level 2

2.1 Degree of barrier-free design

Office **Education** **Hotel** **Shopping centre** **Department stores** **Consumer market** **25**
Residential **Max. 40**

- Quality level 1/DGNB minimum requirement has been achieved.
- A detailed overall barrier-free design concept has been devised.

In addition, use-specific building areas have been designed to be barrier-free as follows:

Office

- At least 10% of the areas designated as workspaces, including the areas that are relevant for operational reasons and the associated circulation and secondary areas
- The requisite barrier-free toilet cubicles are located in these areas.

Education

- All rooms/areas dedicated to teaching, including the associated circulation and secondary areas/rooms

- The requisite barrier-free toilet cubicles in these areas (on each of the relevant storeys)

Residential

- At least 25% of all dwellings (in accordance with the recommendations of the ISO 21542:2021 standard or DIN 18040 - 2), including the associated circulation and secondary areas (footnote from QL1 must be considered for general areas of the building and for dwellings main entrance doors).
- **Additional points for quality level 2:** Of this 25%, every eighth dwelling (one as an absolute minimum) is designed to be barrier-free and to allow for unrestricted use by people in wheelchairs (footnote from QL1 to be considered also for internal areas of the dwellings) + 15

Hotel

- 1% of all rooms (one room as an absolute minimum) comply with the requirements of category non-domestic buildings ISO 21542:2021 or DIN 18040 (the footnote from the QL1 to be considered)

Shopping centre **Department stores** **Consumer market**

- At least 25% of the sales area (def. in Appendix A) in the building plus all areas of the outdoor facilities that are a necessary part of the infrastructure

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3 Quality level 3

3.1 Degree of barrier-free design

Office **Education** **Hotel** **Shopping centre** **Department stores** **Consumer market** **50**

Residential **Max. 65**

- Quality level 1/DGNB minimum requirement has been achieved.
- A detailed overall barrier-free design concept has been devised.

In addition, use-specific building areas have been designed to be barrier-free as follows:

Office

- At least 50% of the areas designated as workspaces, including the areas that are relevant for operational reasons and the associated circulation and secondary areas
- The requisite barrier-free toilet cubicles are located in these areas.

Office **Education** **Residential**

- At least 25% of the areas that people can traverse or spend time in outdoors (where present)

Education

- Quality level 2 has been achieved.
- At least 25% of the areas designated as workspaces, including the areas that are relevant for operational reasons and the associated circulation and secondary areas
- The requisite barrier-free toilet cubicles in these areas

Residential

- At least 50% of all dwellings (in accordance with the recommendations of the ISO 21542:2021 standard or DIN 18040 - 2), including the associated circulation and secondary areas (footnote from QL1 must be considered for general areas of the building and for dwellings main entrance doors).
- **Additional points for quality level 3**: Of this 50%, every eighth dwelling (one as an absolute minimum) is designed to be barrier-free and to allow for + 15

unrestricted use by people in wheelchairs (footnote from QL1 to be considered also for internal areas of the dwellings)

Hotel

- In accommodation with 13 or more rooms, 5% of all rooms are adapted to the needs of people with mobility, hearing and visual impairments in accordance with categories non-domestic buildings ISO 21542:2021 or DIN 18040 (the footnote from the QL1 to be considered)

Shopping centre **Department stores** **Consumer market**

- At least 50% of the sales area in the building plus at least 25% of the areas that people can traverse or spend time in in the outdoor facilities

Also in Shopping centre :

50% areas designated as workspaces for running the building (centre), including the areas that are relevant for operational reasons and the associated circulation and secondary areas

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Quality level 4

4.1 **Degree of barrier-free design**

Office **Education** **Residential** **Shopping centre** **Department stores** **Consumer market** **75**

Hotel **Max. 90**

- Quality level 1/DGNB minimum requirement has been achieved.
- A detailed overall barrier-free design concept has been devised.

In addition, use-specific building areas have been designed to be barrier-free as follows:

Office

- At least 75% of the areas designated as workspaces, including the areas that are relevant for operational reasons and the associated circulation and secondary areas
- The requisite barrier-free toilet cubicles are located in these areas.

Office **Education** **Residential**

- At least 50% of the areas that people can traverse or spend time in outdoors (where present)

Education

- Quality level 2 has been achieved.
- at least 50% of the areas designated as workspaces, including the areas that are relevant for operational reasons and the associated circulation and secondary areas
- The requisite barrier-free toilet cubicles in these areas

Residential

- At least 75% of all dwellings (in accordance with the recommendations of the ISO 21542:2021 standard or DIN 18040 - 2), including the associated circulation and secondary areas (footnote from QL1 must be considered for general areas of the building and for dwellings main entrance doors).
- **Additional points for quality level 4**: Of this 75%, every eighth dwelling (one as an absolute minimum) is designed to be barrier-free and to allow for unrestricted use by people in wheelchairs (footnote from QL1 to be considered also for internal areas of the dwellings) +15

Hotel

- In accommodation with 13 or more rooms, 8% of all rooms (one room as an

absolute minimum) are adapted to the needs of people with mobility, hearing and visual impairments in accordance with categories non-domestic buildings ISO 21542:2021 or DIN 18040 (the footnote from the QL1 to be considered)

- At least 50% of the areas that people can traverse or spend time in outdoors (where present)

Shopping centre **Department stores** **Consumer market**

- At least 75% of the sales area in the building plus at least 50% of the areas that people can traverse or spend time in in the outdoor facilities
- Also provided that: 75% areas designated as workspaces for running the centre, including the areas that are relevant for operational reasons and the associated circulation and secondary areas (may not apply to new Department stores/new consumer markets)

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5 Quality level 5

5.1 Degree of barrier-free design

Hotel **Office** **Education** **Residential** **Shopping centre** **Department stores** **Consumer market** **Assembly buildings** **100**

- Quality level 1/DGNB minimum requirement has been achieved.
- A detailed overall barrier-free design concept has been devised

Also: Barrier-free (in accordance with the applicable standard(s) and the generally accepted rules of good engineering practice) areas:

Office

- At least 95% of the areas designated as workspaces, including the areas that are relevant for operational reasons and the associated circulation and secondary areas
- The requisite barrier-free toilet cubicles are located in these areas.

Office **Education** **Residential**

- At least 75% of the areas people can traverse or spend time in in the outdoor facilities (where present)

Education

- Quality level 2 has been achieved.
- All areas designated as workspaces, including the areas that are relevant for operational reasons and the associated circulation and secondary areas
- The requisite barrier-free toilet cubicles in these areas

Residential

- At least 95% of all dwellings (in accordance with the recommendations of the ISO 21542:2021 standard or DIN 18040 - 2), including the associated circulation and secondary areas (footnote from QL1 must be considered for general areas of the building and for dwellings main entrance doors). Of this 95%, every eighth dwelling (one as an absolute minimum) is designed to be barrier-free and to allow for unrestricted use by people in wheelchairs (footnote from QL1 to be considered also for internal areas of the dwellings)

Hotel

- In accommodation with 13 or more rooms, 10% of all rooms (one room as an absolute minimum) are adapted to the needs of people with mobility, hearing and visual impairments in accordance with categories non-domestic buildings

ISO 21542:2021 or DIN 18040 (the footnote from the QL1 to be considered)

- 100% of the areas that people can traverse or spend time in outdoors (where present)

Shopping centre **Department stores** **Consumer market**

- At least 95% of the sales area in the building plus at least 75% of the areas that people can traverse or spend time in in the outdoor facilities
- Also provided that: 95% areas designated as workspaces for running the centre, including the areas that are relevant for operational reasons and the associated circulation and secondary areas (may not apply to new Department stores/new consumer markets)

Assembly buildings

- The overall concept for building accessibility was created by an expert with the involvement of a responsible officer from the public sector (if local regulation of barrier free building exists). +10

Barrier-free design of workplaces:

- Barrier-free design of at least 10 - 95% of workplace areas, including the office-work relevant areas, also associated circulation and secondary areas, the required barrier-free toilet rooms are arranged in these areas +2 - 10

Circulation spaces:

- At least 10 - 100% of the accessible areas and the common areas of the outdoor facilities are barrier-free (in accordance with applicable standards and the generally recognized rules of technology). +1 - 10

Sanitary areas:

- There is at least one barrier-free toilet in each sanitary facility. Alternatively, it is ensured that barrier-free sanitary areas are easily and quickly accessible for people with restricted mobility (without elevator routes) and that these can be used by people with different mobility restrictions (different space requirements). +5

Space for spectators:

- In assembly rooms, at least 2% of the visitor spaces (but at least four spaces) are available for wheelchair users along with additional seats for accompanying persons in the immediate vicinity. +5

  Alternatively:
- Designated barrier-free spectator seats for people with mobile devices (e.g. wheelchair users) was implemented in different arrangements in the room. Thereby space is available in at least 3 different price categories.
- The proportion of wheelchair spaces was adapted to an above-average need (> 2% of the visitor spaces, e.g. in health resorts or bathing resorts). +2
- In addition to the seats designed for wheelchair users, an appropriate number of seats in different qualities / equipment is offered, which offer better recognizability and / or increased comfort for people with impaired motor or sensory impairment:
  - Seating that makes getting up e.g. by not too low seat height and grip options in the armrests +2
  - Seats that contrast with surrounding surfaces +2
  - Wider seats for tall people +2
  - Devices are provided on furniture (e.g. on tables or chairs) on which walking aids such as sticks or crutches can be safely placed. +2

Equal participation:

- Podiums, orchestra and / or stage areas are accessible by ramps / elevators / lifting platforms for people with mobile mobility devices both from the visitor area and from the artist area. +5
- In all barrier-free areas furniture is designed in a way that they can be easily used by people with restricted mobility (wheelchair-accessible / height-adjustable). The furniture is part of the detailed overall concept for accessibility. +5
- Exhibition areas / showcases / exhibits are designed in all areas of the barrier-free areas in such a way that they are easily and completely recognizable for people with restricted mobility. Information aids can be used equally. The exhibition concept is accordingly part of the detailed overall concept for accessibility. +5

The minimum requirement to be fulfilled, a linear interpolation between the individual quality levels is possible.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The percentage of the building that consists of barrier-free areas and the number of barrier-free bathroom facilities are good key performance indicators (KPIs) to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	The percentage of barrier-free areas (or (housing) units) in the building, if appropriate differentiated by areas that allow for unrestricted use by people in wheelchairs	[%]
KPI 2	Number of barrier-free bathroom facilities	[number]
KPI 3	Percentage of barrier-free outdoor areas that people can traverse	[%]
KPI 4	Application of Levels (s) indicator 2.3 “Design for adaptability and renovation” (Level 1, L1.4., 4.) “Checklist Adaptation of residential properties to life changes” was carried out. Data has been transferred to the L1.5 reporting format.	[-]

Synergies with DGNB system applications

- **DGNB OPERATION:** Structural (and organisational) provisions that afford inclusive access and accommodate the needs of families and senior citizens are reflected positively in the evaluation under criterion SOC9.2 in the Building in use scheme.
- **DGNB RENOVATED BUILDINGS:** There are high synergies with criterion SOC2.1 in the Renovated buildings scheme.
- **DGNB INTERIORS:** There are synergies with criterion SOC2.1 in the Interiors scheme.
- **DGNB DISTRICT:** Barrier-free design for outdoor spaces is evaluated under criterion SOC2.1 of the Urban district and Business district schemes.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

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II. Additional explanation

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III. Method

When evaluating the barrier-free design of a building, the extent to which all people have equal access to and use of the building is examined and assessed.

All buildings that are to be certified must fulfil the barrier-free design requirements of the building regulations in accordance with the applicable standard(s) and the generally accepted rules of good engineering practice; they must fulfil the "DGNB minimum requirement" as an absolute minimum. The DGNB minimum requirement is based on the most recent applicable international building norm, which constitute standard and minimum building regulations and are used by states as the basis for their state building regulations. Assessment is implemented through the ISO 21542:2021 [Accessibility and usability of the built environment].

It is also advisable to use the latest version of the "Berlin-Design for all" [Accessible Public Buildings] guide as an aid to planning and as a planning tool. This describes fields of action and potential solutions for implementing the objectives and requirements of ISO 21542:2021.

Barrier-free design at the planning and construction stages

The planning phase offers the greatest opportunities for influencing the implementation of barrier-free design in the form of structural measures. Due to the complexity of the various legal bases of barrier-free building, it is advisable to enlist the services of experts in order to implement the planning and provide specialist advice throughout the project.

In order to incorporate all relevant aspects of barrier-free design in the planning and construction phases, it is of paramount importance that the specific needs of the project are established at the outset. The requirements ascertained from this are generally based on the specifications agreed with the building owner as part of requirements planning (e.g. barrier-free workstations and workspaces), and are integrated into an overall barrier-free design concept and incorporated into draft and detailed designs.

From quality level 2 onwards, an overall barrier-free design concept must be devised. This should provide information on the scope of the building requirements that must be fulfilled, as well as any retrofitting work that may need to be carried out at a later date. Special barrier-free design requirements for workstations and workspaces that have been established, e.g. in consultation with the representative bodies for people with severe disabilities, should also be described and represented in the overall concept (where this exists). The concept can also include solutions that fulfil the objectives of ISO 21542:2021 but that are not expressly stated in this ISO standard.

Barrier-free design measures for the building

In all publicly accessible and non-public areas of the building, all building requirements must be fulfilled essentially in line with the generally accepted rules of good engineering practice. This includes, for example, full accessibility, areas in which to manoeuvre, door and corridor widths, preparations for support rails near the toilet.

In areas that are not open to the public, aids such as a guidance system, contrasts, tactile elements, etc., can be retrofitted at a later date (provided these are not required immediately for performing certain activities when the building first enters into use). Full documentary evidence must be provided for all the retrofitting work in the form of plans with a well-conceived overall design concept (list of measures that are included in the plan but have yet to be implemented).

Barrier-free building areas:
Barrier-free use encompasses various areas, especially the "publicly accessible areas" and the areas designated as workspaces, including the associated circulation and secondary areas. Circulation areas and outdoor facilities are included in the assessment, since these generally form the outdoor infrastructure.
Other areas of the building are described in the usage-specific description.

Publicly accessible areas:
According to this criterion "publicly accessible areas" are areas of the building that are intended to allow anyone (the building's users and/or visitors) to travel across and/or use them, e.g.:

- Entrance areas and foyers
- Cloakrooms
- Sales rooms
- Public bathroom facilities
- Offices designed to accommodate visitors
- Counters and waiting areas
- Press and representation areas
- Rooms offering food and accommodation
- Exhibition rooms and event halls
- Reading rooms, open-access library areas
- Teaching and conference rooms
- Rooms for sport
- Associated infrastructure areas or corridors adjoining the rooms listed above

For the purposes of this criterion, it does not matter whether the services offered are public or private, and whether they are provided free of charge or for a charge.

Areas designated as workspaces:
Areas that are not open to the public are predominantly used as workspaces. Areas designated as workspaces are areas required for performing the normal range of activities, such as:

- Working rooms (e.g. office rooms, laboratories)
- Meeting and conference rooms
- Storage, machinery and ancillary rooms
- Break and ready rooms
- Kitchenettes and cafeterias
- First-aid rooms
- Bathroom facilities
- Internal infrastructure (circulation routes, ramps, stairways, doors, escape routes, emergency exits)

If additional areas are required for performing the normal range of activities, these must also be designed to be barrier-free. Barrier-free design must be implemented in all areas that are relevant for operational reasons.

Circulation areas and outdoor facilities:
Where there are areas that people can spend time in outdoors, documentary evidence must be provided of the extent to which these allow for barrier-free access and can be used for their intended purpose.

Sales areas:
For the purposes of this criterion sales rooms are defined as follows:

- Salesrooms (Department stores, shop rooms, kiosks, including store windows)
- Exhibition spaces (Exhibition halls, sample rooms)
- Operating rooms (Sorting rooms, distribution rooms, packing rooms, dispatch rooms, supply and Disposal of bases)

APPENDIX 1

Documentary evidence template

Confirmation of the planning and implementation of barrier-free design measures for the building:

Assurance by the appointed architect or expert that the building complies with the barrier-free design requirements listed in the criterion. The architect or expert must be suitably qualified.

We, _____, hereby confirm that the barrier-free design requirements in accordance with the quality level (as per DGNB criterion SOC2.1)

specified below of the _____ scheme

have been planned and implemented
in the _____ project.

REQUIREMENT	POINTS (ENTER)	REQUIREMENT FULFILLED
Quality level 1 has been achieved. Documentary evidence has been appended.	_____	☐
Quality level:_____ for scheme:_____ has been achieved. Please note: The DGNB reserves the right to request individual pieces of documentary evidence on a random basis at a later date as part of the conformity inspection.	_____	☐

_____

Date Signature of the appointed architect/expert Stamp

The auditor hereby confirms that they have checked that the information contained in the relevant documents is a true and fair representation of the facts:

_____

Date Auditor's signature Stamp

IV. Usage-specific description

Dwellings: **Residential**

Areas specific to the Residential category that are also relevant generally include:

- External infrastructure (including the building entrance)
- Internal infrastructure (after the building entrance) – stairwells, incl. lifts and doors, etc., including the entrance to individual dwellings
- Dwellings
- Ancillary rooms such as basement rooms, storage areas for wheelchairs/walking aids, assessed by quantity and quality

Trading spaces: **Consumer market** **Shopping centre** **Department stores**

Retail establishments are publicly accessible buildings with barrier-free building specifications that are often covered in the state building regulations, the incorporated technical building requirements and the state-specific retail establishment regulations. Requirements with regard to circulation areas, changing rooms, floor coverings, check-out areas, service counters and the design of navigation systems, etc. can be found in ISO 21542 and must be fulfilled. Measures that must be planned and implemented by the tenant must be confirmed by the tenant. This confirmation must be included with the other documentary evidence submitted for the purposes of certification; where the tenant is not yet known, confirmation of these measures must be provided for in the form of a tenant interior finishing obligation in the tenancy agreement.

Furnishing requirements intended to facilitate use by people with impaired motor skills, sensory impairments and/or cognitive impairments are also beneficial in the overall barrier-free design concept that is to be devised from quality level 2 onwards, and should be incorporated from the planning stage. These include, for example, sales display cabinets, sales counters and shelving systems that allow goods in self-service areas to be reached.

Assembly buildings

“Assembly buildings” are publicly accessible buildings, whose structural requirements for barrier-free construction are taken into account in the state building regulations. Specifications for circulation areas, seating, toilet rooms, fire protection equipment and the design of orientation systems are, among others to be found and implemented according to ISO 21542 or DIN 18040 – 1.
If the planning and implementation of above stated measures is in the responsibility of a tenant or the operator, their implementation must be confirmed and enclosed with the documentation for the certification.

For “Assembly buildings”, creation of an overall **concept for barrier-free access** is already required in quality level 1. Since this is all about the "publicly accessible buildings", all publicly accessible areas must be designed in a way that independent, equal and safe use of these areas is possible for all building users, including people with disabilities.

The overall concept for barrier-free access is intended to provide information on the scope of the building's technical requirements that enable people with motor or sensory impairments to use the building autonomously. This also includes enabling them to actively participate in self-rescue in the event of an emergency (taking into account fire protection and escape route security). It is recommended that an expert for accessibility accompanies the preparation of the concept with the involvement of a responsible representative for people with disabilities*.
(if possible*, since state and district representatives – not always available in the countries without statutory regulation).

For “Assembly buildings”, from quality level 5 assessment is carried out on the basis of qualitatively and

quantitatively implemented aspects.

Accessible design of workplaces:
additional requirements for the barrier-free design of workplaces, which are presented and structurally implemented in the overall concept will be rated positively.

Traffic areas areal/campus situation:
In the case of building blocks, requirements for the route concept between the individual buildings and functions must be included.

Circulation areas in the building:
All circulation areas in “Assembly buildings” are designed in a way that they can be used by all user groups in a comfortable and independent manner (e.g. stairs should have a barrier-free, equivalent quality for path routs (Ramps / elevator), doors should be easy to open, close and pass through for all users).
Cash registers / checkpoints allow safe and unhindered use of all users (e.g. wheelchair users, people of short stature or people who depend on the help of other people or aids) with sufficient passage widths and movement areas.

Sanitary areas:
The quick accessibility of barrier-free toilets and sufficient space in the sanitary areas for people with restricted mobility have often of great importance. Barrier-free sanitary areas / toilets are to be planned in a way that:

- that these are conveniently located in the building, thus ensuring easy and quick access for people with restricted mobility;
- that these can be used by people with different mobility restrictions (different space requirements);

Space for spectators:
The implementation of more space for people with reduced senses or people with reduced mobility (e.g. wheelchair users) along with the associated seats for accompanying persons (or assistance dogs) is also rated positively with a view to demographic change. Seats should be available for different users. This applies to both the number of seats and their equipment (e.g. armrests and backrests, legible seat numbering, support of the recognizability of the spectator seats through the use of contrasts to surrounding surfaces). Safe and comfortable access to the spectator seats (platforms / ramps), as well as an appropriate view of the performance areas (e.g. through a suitable seat height) and good hearing quality through the use of suitable hearing enhancement systems must also be guaranteed. This must already be taken into account in the conception and planning (for fixed, but also for loose chairs).
The implementation of more space for sensory or motor-impaired people (e.g. wheelchair users) along with associated seats for accompanying persons (or assistance dogs) is rated positively with a view to demographic change.

For a positive evaluation:

- Seats in different qualities (e.g. seat size / equipment) are offered;
- Seats are offered in different (spectator) areas and price categories and thus enable a seat selection that promotes the integration of people with disabilities;
- the proportion of wheelchair spaces is adapted to an above-average need (location and event-specific, such as in health resorts / bathing resorts);
- at least 2% of the seats plus seats for accompanying persons (in the immediate vicinity) are implemented. For the big number of countries, a doubling due to demographic change makes sense.
- Devices are provided on furniture (e.g. on tables or chairs) on which walking aids such as sticks or crutches can be safely placed.

Equal participation:
“Assembly buildings” are buildings in which events, assemblies, exhibitions and / or cultural performances take place. In order to allow people with motor and / or sensory impairments to participate in what can be “experienced” in the building, it is necessary not only to guarantee structural accessibility, but also to create opportunities that enable those affected to participate equally. This can be done, for example, with the help of appropriately designed furniture, the use of technical aids and various forms of presentation, information and communication that take into account the needs of the user.
“Assembly buildings” should offer solutions for all categories of disabilities, in order not only to enable those affected to enter the building, but also to convey the contents of the exhibition to them. The overall concept for accessibility should therefore also take into account aspects that go beyond structural accessibility:

- Podiums, orchestra and / or stage areas should be accessible from both the visitor area and the artist area (e.g. with the help of ramps / elevators / lifting platforms, taking into account the multi-sensory principle);
- Furniture should be designed in all areas of the barrier-free areas in such a way that it can be easily used by people with reduced mobility (e.g. by taking into account the ability to drive under or height adjustment of tables and lecterns, including technology such as microphone / illumination or consideration of visibility and usability at the counter height from both a sitting and a standing position);
- Exhibition areas / showcases / exhibits and their content should be designed in all areas of the barrier-free areas in such a way that they are easily recognizable and understandable for people with motor and sensorics disabilities with the help of various information and communication aids (e.g. via electro-acoustic sound systems, audio signals, Lighting, tactile plans). The exhibition concept is accordingly part of the detailed overall concept for accessibility;

APPENDIX B – DOCUMENTATION

I. Required documentation

Documentation that must be provided:
Documentation for "Quality level 1/DGNB minimum requirement":

General explanations and descriptions of the building's barrier-free design. Relevant excerpts from plans in which the areas in which to manoeuvre, clearance widths, etc. that are a necessary part of barrier-free design are clearly marked and represented with dimensions:

- Relevant plans (e.g. floor plans showing the circulation areas between all the use areas, ground floor plan with outdoor facilities and transition to the public space, including car parks).
- Relevant details (transitions, navigation systems, operating elements, fixtures, equipment, etc.)
- Photo documentation
- Confirmation by the appointed architect or expert (in accordance with Appendix 1) that the building complies with the minimum barrier-free design requirements listed in this criterion.

Documentary evidence and confirmation of the planning and implementation of barrier-free design measures for the building for quality levels 2–5:

The areas defined as barrier-free workspaces and the outdoor spaces in which people can spend time must be drawn and labelled on the floor plans and outdoor facilities plan, which must be submitted. In addition, assurance by the architect or expert that the building complies with the barrier-free design requirements listed in the criterion is acceptable as documentary evidence (see Appendix 1). The architect or expert must be suitably qualified.

The DGNB reserves the right to request individual pieces of documentary evidence on a random basis at a later date as part of the conformity inspection. The documentary evidence that is required in such cases is as follows:

Information on the building's barrier-free design

- Detailed description of the **overall concept** of the barrier-free design outside and inside the building, including all the barrier-free design measures.
- Overall concept
- Documentary evidence of the individual measures as part of planned retrofitting work stipulated in the concept

The following must be submitted for the (indoor and outdoor) areas defined as barrier-free:

- Floor space list featuring the barrier-free working and use areas and specifying the proportion of barrier-free floor space (demonstrating compliance with the areas required in the quality level). Here, the proportion of barrier-free floor space is stated in relation to the usable area (UA according to the definition under the [T&D_04]).
- Documentary evidence of barrier-free design based on plans and photos: The barrier-free rooms (incl. the barrier-free toilet cubicles), areas in which to manoeuvre, corridors, door widths, etc. must be drawn, marked and labelled with dimensions using photos or plans:
  - Relevant floor plans, e.g. for a standard floor, site plan (showing the outdoor facilities), attic and, if appropriate, basement floor/underground garage
  - Relevant sections and detailed drawings (transitions, navigation systems, operating elements, fixtures, equipment, etc.)
  - Photo documentation with explanations

APPENDIX C – LITERATURE

I. Version

Change log based on 2018 version

PAGE	EXPLANATION	DATE
all	General, Evaluation and Usage specific description: scheme “Assembly buildings” has been added	16.09.2021
	Literature: the new alternative standard DIN 18040 has been added	16.09.2021
	KPIs: the new Level(s) relevant KPI 4 has neem added	16.09.2021
	The applicable standard has been updated from ISO 21542:2011 to 21542:2021	16.09.2021

II. Literature

- DIN EN 81-70: Safety rules for the construction and installations of lifts, September 2005
- Sustainable Development Goals, United Nations/globalgoals.org
- Berlin-Design for all: Accessible Public Buildings (2nd edition) - Berlin Senate Department for Urban Development and the Environment Communication, Berlin, March 2013
- ISO 21542:2011 Building construction — Accessibility and usability of the built environment Technical Committee : ISO/TC 59/SC 16
- DIN 18040 – 1 Construction of accessible buildings, Design principles – Part 1: Publicly accessible buildings, DIN Deutsches Institut für Normung e.V. 2010
- DIN 18040 – 2 Construction of accessible buildings, Design principles – Part 2: Dwellings, DIN Deutsches Institut für Normung e.V. 2011

Technical quality

The seven criteria of technical quality provide a scale for evaluating the **technical quality** in view of relevant sustainability aspects.

TEC1.1	Fire safety
TEC1.2	Sound insulation
TEC1.3	Quality of the building envelope
TEC1.4	Use and integration of building technology
TEC1.5	Ease of cleaning building components
TEC1.6	Ease of recovery and recycling
TEC1.7	Immissions control
TEC3.1	Mobility infrastructure

TEC1.1

Fire Safety

Objective

Fire events do not only endanger life and safety of humans and animals but also damage the building fabric, emit pollutants and thus cause harm to the environment. This is why the issue “fire safety” forms an integral part of DGNB`s certification procedures.

Please note: neither the DGNB certificate in total nor the fire protection evaluation points awarded by the DGNB replace official permits or official acceptance. In particular, due to the limited scope of checks and assessments, the awards do not contain confirmation that the project has actually been implemented and is utilized in accordance with the fire protection documents submitted and/or provided otherwise by the Applicant for certification purposes. Rather, the certificate and the fire protection evaluation points awarded are mainly based on declarations made by the Applicant and DGNB as well as its auditors rely on such declarations being complete, true and not misleading. The Applicant`s responsibility to ensure full conformity with the applicable fire protection regulation remains unaffected. For further restrictions please see preamble para 2 and section 13.2 of the Certification Agreement.

Benefits

The main benefits of fire safety measures are to reduce the potential loss of lives and injuries during a fire, as well as the destruction caused by fire, and hence the associated repair and liability costs in the aftermath. It is essential to prevent the occurrence of a fire and the spread of fire and smoke, which will affect not just the building itself, but also its surroundings. Equipping a building with sufficient fire safety measures will also bring reassurance to building users during normal operation by allaying safety concerns.

Fire safety measures include those that are

- intended to prevent ignition of an uncontrolled fire,
- used to limit the development and impacts of a fire after it starts,
- planned during the construction of a building or implemented in existing structures,
- taught to the building occupants.

Essential fire safety measures are installed within a building or premises as a vital function to prevent injury and loss of life in the event of fire. Furthermore, these ensure that people and animals can be rescued and extinguishing work can be carried out effectively in the event of a fire.
Examples of such measures are listed in indicator 2 and indicator 3 below.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Low	3.4	Reduction of premature death, promotion of good health/well-being	15.1	Biodiversity
	15.5	Natural habitats		

Outlook

Ideally, this criterion will no longer be needed in a few years' time, when the topics addressed in the criterion have become the local standard practice.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	**2.5%**	**4**
Consumer market **Shopping centre**	**2.9%**	**4**
Department stores		
Logistics **Production**	**2.7%**	**4**
Assembly buildings	**2.6%**	**4**

EVALUATION

Fire safety is evaluated based on a checklist. A maximum of 100 points can be attained. For a positive evaluation of these indicators, the design documents must clearly demonstrate that the minimum standards have been achieved. Note that the building inspection authority allows for alternative fire safety concepts and permits deviations from the valid building regulation under certain conditions.

NOTE: Buildings that are without basic fire safety features and do not comply with local building regulations cannot be certified.

ADVICE: The checklist points of indicators 2 and 3 can only be achieved if the additional measures are not mandatory. This means when additional measures are voluntary options which are not part of the local building regulation or compensation measures as part of the fire safety plan. Other local fire safety features of the design and structure (indicator 2) or of the technical building system (indicator 3) not listed below could be considered after consultation from DGNB experts.

NO.	INDICATOR	POINTS
1	**Fire safety certificate** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production Office** **Education** **Residential** **Hotel** **Assembly buildings** Fire safety features have been designed in accordance with the local building regulations, or deviations from local building regulations have been approved by the relevant authorities and meet the required safety level.	**max. 50**
2	**Additional fire safety features of the design and structure** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production Office** **Education** **Residential** **Hotel** **Assembly buildings**	**max. 60**
	■ Creating smaller fire and smoke compartments	10
	■ Providing direct external access to fire alarm centre and equipment room / fire brigade control panel, or fire brigade information system.	5
	■ Providing escape routes which are at least 20% shorter than the maximum permissible length	10
	■ Providing escape routes which are at least 25% wider than the minimum required width.	10
	■ Installing a photoluminescent guiding pathway close to the ground	10
	■ Installing self-closing panic locks/bolts on the building entrance doors or emergency exit doors	10
	■ Providing a glass panel on all doors on escape routes	5

3 Additional fire safety features of the technical building system

Consumer market · Shopping centre · Department stores · Logistics · Production · Office · Education · Residential · Hotel · Assembly buildings	max. 100
■ Installing a comprehensive fire reporting and alarm system beyond the extent required by building regulations	15
■ Installing a dynamic escape and rescue guidance system	12.5
■ Increasing illumination of safety lighting (at least 10 Lux)	7.5
■ Fitting smoke extraction systems with air vents / air supply apertures that open automatically.	7.5
■ Installing an additional (i.e. not required) automatic fire extinguishing system (e.g. sprinkler system)	12.5
■ Implementing the automatic fire extinguishing system as a low pressure water mist extinguishing system	7.5
■ Implementing the automatic fire extinguishing system as a high pressure water mist extinguishing system	12.5
■ Equipping the building with a radio system tuned to the Emergency services bandwidth and linked to the fire brigade where this is not required by building regulations	7.5
■ Installing safety equipment e.g. fire extinguishers, wall hydrants, emergency buttons with photoluminiscent materials when this is not already required by fire safety regulations	2.5
■ Installing a lift for the fire brigade or designating a planned passenger lift as a fire brigade lift when this is not already required by building regulations	15

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Not available

NO.	KEY PERFORMAMCE INDICATORS / KPIS	UNIT

Synergies with DGNB system applications

- **DGNB DISTRICTS:** There are synergies with indicator PRO1.10.3 Fire Safety concept from the scheme for event areas.
- **DGNB BUILDINGS IN USE:** There are synergies with criterion TEC9.1 from the scheme for buildings in use.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Fire safety of buildings is of utmost importance. Therefore, this criterion contains a minimum requirement (i.e. indicator 1). If this is not met, the building cannot be certified. The minimum requirement is considered to be providing basic fire safety features and compliance with local building regulations.

II. Additional explanation

Minimum requirements for fire safety are regulated in local building regulations.
With structural and technical measures, fire protection can be planned from a sustainable point of view that goes beyond the minimum requirements. In the sense of sustainability and the prevention of injury and life as primary goal, it is evaluated positively if additional measures are implemented, e.g. to reduce fire events risk or to increase the safety of escape and rescue routes.
The basis for the evaluation is the effectiveness of the measures as well as the costs of their implementation.

III. Method

Indicator 1. Fire safety certificate
This indicator represents the minimum requirement for fire safety. It relates to basic fire safety features and their compliance with local building regulations. Requests for approvals of deviations from local building regulations are examined on a case-by-case basis.

Indicator 2. Additional fire safety features of the design and structure
Additional points may be allocated for each feature of the design or structure which enhances fire safety and contributes to the building exceeding minimum building regulation requirements. The effectiveness of any such features should be considered within the context of each individual building.
Additional fire safety measures such as smaller fire and smoke compartments, shorter escape route length or larger escape route width can be considered to attain additional points.
This indicator is evaluated by computing the sum of the individual measures.

Indicator 3. Additional fire safety features of the technical building
Additional points may be allocated for each technical feature of the building system which enhances fire safety and contributes to the building exceeding the minimum building regulation requirements. The effectiveness of any such features should be considered within the context of each individual building.
The method is identical to those of Indicator 2. If the legally required engineering measures for fire safety are exceeded, further points can be attained. This includes the installation of a comprehensive fire alarm system, a dynamic escape and rescue guidance system or an automatic fire extinguishing system. This indicator is evaluated by computing the sum of individual measures.

IV. Usage-specific description

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APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The allocation of points for individual indicators must be backed up by comprehensive and plausible evidence.

Indicator 1. Fire safety certificate

- Summary of legal requirements and any additional conditions attached to planning permission.
- Precisely formulated fire safety concept.
- Detailed fire safety plan and compensation measures.

Indicator 2. Additional fire safety features of the design and structure

- Evidence of additional fire safety features of design and structure, including e.g. extracts from fire safety plan, drawings and specifications for additional features, or photographic evidence.

Indicator 3. Additional fire safety features of the technical building

- Evidence of additional technical fire safety features, including e.g. extracts from fire safety plan, drawings and specifications for additional features, or photographic evidence.

APPENDIX C – LITERATURE

I. Version

Change log based on version 2017

PAGE	EXPLANATION	DATE
all	General: scheme “assembly buildings” has been added	16.09.2021

II. Literature

- DIN EN 15269. Extended application of test results for fire resistance and/or smoke control for doors, shutter and operational window assemblies, including their elements of building hardware. The following parts of this Standard can be considered for this criterion:
  - DIN EN 15269-1. General requirements - Part 1. Berlin: Beuth Publisher. July 2010
  - DIN EN 15269-2. Fire resistance of hinged and pivoted steel doorsets – Part 2. Berlin: Beuth. February 2012.
  - DIN EN 15269-3. Fire resistance of hinged and pivoted timber doorsets and openable timber framed windows – Part 3. Berlin: Beuth Publisher. October 2012
  - DIN EN 15269-7. Fire resistance for steel sliding doorsets - Part 7. Berlin: Beuth Publisher. April 2010
  - DIN EN 15269-10. Fire resistance of steel rolling shutter assemblies - Part 10. Berlin: Beuth Publisher. July 2011
  - DIN EN 15269-20. Smoke control for hinged and pivoted steel, timber and metal framed glazed doorsets - Part 20. Berlin: Beuth Publisher. December 2009

- DIN EN 13501. Fire classification of construction products and building elements. The following parts of this Standard can be considered for this criterion:
  - DIN EN 13501-1. Classification using data from reaction to fire tests – Part 1. Berlin: Beuth Publisher. January 2010
  - DIN EN 13501-2. Classification using data from fire resistance tests, excluding ventilation services – Part 2. Berlin: Beuth Publisher. December 2016

- DIN EN 1634-1. Fire resistance test for door and shutter assemblies and openable windows – Part 1. Berlin: Beuth Publisher. April 2018

- DIN EN 12101. Smoke and Heat Control Systems. The following parts of this Standard can be considered for this criterion:
  - DIN EN 12101-1. Specification for smoke barriers – Part 1. Berlin: Beuth Publisher. October 2018
  - DIN EN 12101-2. Natural smoke and heat exhaust ventilators – Part 2. Berlin: Beuth Publisher. August 2018.
  - DIN EN 12101-3. Specification for powered smoke and heat control ventilators – Part 3. Berlin:

Beuth Publisher. December 2015

- DIN EN 12101-4. Natural smoke and heat exhaust ventilators – Part 4. Berlin: Beuth Publisher. August 2017
- DIN EN 12101-7. Smoke duct sections – Part 7. Berlin: Beuth Publisher. August 2011

TEC1.2

Sound insulation

Objective

Ensuring sound insulation that is appropriate for the room usage type prevents excessive disturbances.

Benefits

Reducing disruptive noises has a significant impact on the well-being and satisfaction of users in a building. Good sound insulation enables users to concentrate better, helps ensure their privacy, provides them with better peace and quiet, and positively impacts their living comfort and health.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO GERMAN SUSTAINABILITY STRATEGY	
Moderate	3.4	Reduce mortality from non-communicable diseases and promote mental health	3.1.a/b	Health and food

Outlook

There are currently no plans to make any of the requirements stricter.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	**1.9%**	**3**
Consumer market **Shopping centre**	**0.0%**	**0**
Department stores **Logistics**		
Production		
Assembly buildings	**1.3%**	**2**

EVALUATION

The evaluation is based on the least favourable indoor situation. The sound insulation requirements in each case must always be met by all components in order to ensure that the corresponding quality level is reached. In this criterion, a total of 115 points can be achieved (100 points for **Residential** **and** **Assembly buildings** Type II) but only a maximum of 100 points can actually be awarded. **Assembly buildings** are divided into different building types with regard to the assessment. These are under the chapter "IV. Usage-specific description" described.

No requirement/evaluation for **Consumer market** **Department stores** **Shopping centre** **Logistics** **Production**

NO.	INDICATOR			POINTS
1	**Airborne sound insulation between rooms**			
1.1	**Within the room's own area – partition walls R'$_w$ and corridor doors R$_w$**			
	Office			**Max. 20**
	Assembly buildings Type I			**Max. 30**
	Rooms with normal requirements		**Office**	**+Max. 10**
			Assem. Type I	**+Max. 15**
	Partition walls R'$_w$	Doors R$_w$		
	■ ≥ 37 dB	≥ 27 dB	**Office**	5
			Assem. Type I	7,5
	■ ≥ 42 dB	≥ 32 dB	**Office**	7.5
			Assem. Type I	10
	■ ≥ 45 dB	≥ 37 dB	**Office**	10
			Assem. Type I	15
	Rooms with increased requirements			**+Max. 10**
			Assem. Type I	**+Max. 15**
	Partition walls R'$_w$	Doors R$_w$		
	■ ≥ 42 dB	≥ 32 dB	**Office**	5
			Assem. Type I	7,5
	■ ≥ 45 dB	≥ 37 dB	**Office**	7.5
			Assem. Type I	10
	■ ≥ 50 dB	≥ 42 dB	**Office**	10
			Assem. Type I	15
1.2	**Partition walls R'w and doors Rw**			
	Office			
	Insulation against noise from other areas – Partition walls R'w			**Max. 10**
	■ Minimum requirements in accordance with DIN 4109-1* (53 dB)			5
	■ As above, but with over-fulfilment by 2 dB (≥ 55 dB)			7.5
	■ As above, but with over-fulfilment by 2 dB (≥ 57 dB)			10
	Hotel			**Max. 40**
	Partition walls R'w (of hotel rooms)			**+Max. 20**
	■ Minimum requirements in accordance with DIN 4109-1* (47 dB)			5

■ As above, but with over-fulfilment by 3 dB (≥ 50 dB)	10
■ As above, but with over-fulfilment by 3 dB (≥ 53 dB)	15
■ As above, but with over-fulfilment by 3 dB (≥ 56 dB)	20
Doors Rw (from hotel rooms to corridors)	**+Max. 20**
■ Minimum requirements in accordance with DIN 4109-1* (32 dB)	7.5
■ As above, but with over-fulfilment by 5 dB (≥ 37 dB)	15
■ As above, but with over-fulfilment by 5 dB (≥ 42 dB) or alternatively a design of a closed corridor/hallway	20

Note: * Requirements and calculation methods to be applied in accordance with the valid building regulations. DIN 4109-1: 2016-07 or 2018-01, calculation method DIN EN 12354-1 or equiv.

Education

Insulation against noise from classrooms	**Max. 35**
Insulation against noise from other areas – Partition walls R‘w	
■ Minimum requirements in accordance with DIN 4109-1 (47 dB)	20
■ As above, but with over-fulfilment by 3 dB (≥ 50 dB)	35

1.3 Separating ceilings R’w

Office **Assembly buildings** Type I

Separating ceilings in their own areas and other areas R‘w	**Max. 10**
■ Requirements in accordance with DIN 4109* (≥ 54 dB)	5
■ As above, but with over-fulfilment by 2 dB (≥ 56 dB)	7.5
■ As above, but with over-fulfilment by 2 dB (≥ 58 dB)	10

Education **Hotel***

Separating ceilings between common rooms R'_w	**Max. 20** 7.5
■ Requirements in accordance with DIN 4109* (≥ 54 dB Hotel), (≥ 55 dB Education)	
■ As above, but with over-fulfilment by 2 dB (≥ 56 dB)	15
■ As above, but with over-fulfilment by 2 dB (≥ 58 dB)	20

1.4 Standard flanking transmission level difference $R_{l,w,R}$ or $D_{n,f,w,R}$

Office **Assembly buildings** Type I

Rl,w,R or Dn,f,w,R applies for all flanking components (floor, ceiling, façade) for each partition wall grid	**Max. 15**
■ ≥ 42 dB	5
■ ≥ 47 dB	10
■ ≥ 50 dB	15

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2 Footfall sound insulation

2.1 Footfall sound insulation of dividing ceilings and stairs

Office **Education** **Assembly buildings** Type I

2.1.1 In its own area (use of the same building)

Requirement $L'_{n,w}$ – Horizontal	Requirement $L'_{n,w}$ – Vertical	**Max. 15**
■ ≤ 60 dB	≤ 53 dB	5
■ ≤ 53 dB	≤ 46 dB	10
■ ≤ 46 dB	≤ 46 dB (not taking into account soft flexible floor coverings)	15

Note: * Requirements and calculation methods to be applied in accordance with the valid standard DIN 4109-1: 2016-07 or 2018-01, calculation method DIN EN 12354-2 or equiv.

	Office **Education** **Assembly buildings** Type I	
2.1.2	Insulation against noise from other areas (insulation against noise from other usages and from leasing of space)	**Max. 15**
	■ Minimum requirements in accordance with DIN 4109-1:* (≤ 53 dB)	5
	■ Increased sound insulation in accordance with Supplement 2 to DIN 4109 (≤ 46 dB)	10
	■ Increased sound insulation in accordance with Supplement 2 to DIN 4109, over-fulfilment by 3 dB (≤ 43 dB)	15
	Hotel	
	Insulation against noise from other areas (insulation against noise from other usages and from leasing of space)	**Max. 20**
	■ Minimum requirements in accordance with DIN 4109-1:* (≤ 53 dB)	7.5
	■ Increased sound insulation in accordance with Supplement 2 to DIN 4109 (≤ 46 dB)	15
	■ Increased sound insulation in accordance with Supplement 2 to DIN 4109, over-fulfilment by 3 dB (≤ 43 dB)	20

3 Airborne sound insulation

3.1 Airborne sound insulation against external noise

Office **Education** **Hotel** **Assembly buildings** Type I	**Max. 15**
■ DIN 4109-1:* fulfilled, see Appendix 1	5
■ DIN 4019-1:* over-fulfilment by 3 dB, see Appendix 1	10
■ DIN 4019-1:* fulfilled, with Ctr. 100 – 5000, see Appendix 1	15

Note: * Requirements and calculation methods to be applied in accordance with the valid standard DIN 4109-1: 2016-07 or 2018-01, calculation method DIN EN 12354-3 or equiv.

4 Airborne sound insulation against noise from building services installations (water installations, other building services)

4.1 Airborne sound insulation against building services installations

Office **Education** **Assembly buildings** Type I	**Max. 15**
■ DIN 4109-1:* fulfilled, see Appendix 1	5
■ DIN 4109-1:* over-fulfilment by 3 dB	10
■ DIN 4109-1:* over-fulfilment by 5 dB	15
Hotel	**Max. 20**
■ DIN 4109-1:* fulfilled, see Appendix 1	7.5
■ DIN 4109-1:* over-fulfilment by 3 dB	15
■ DIN 4109-1:* over-fulfilment by 5 dB	20

Note: * Requirements and calculation methods to be applied in accordance with the valid standard DIN 4109-1: 2016-07 or 2018-01, calculation method DIN EN 12354-5 or equiv.

5 Sound insulation in residential buildings

5.1 Sound insulation requirements

Residential	**Max. 100**
Creation of a concept plan for reducing disruptive noises, at least in the service phase	50

4 of the project at the latest.

The service phases described under the chapter “terms and definitions” (T&D_01) of the document “Evaluation and structure of the DGNB system”.

The sound insulation concept has been implemented. 100

6 Sound insulation for special building types

6.1 Sound insulation concept plan — Max. 100

Assembly buildings Type II

Creation of a concept plan for reducing disruptive noises where the following aspects have to been considered:

- Indoor noise level, consideration through the structural sound insulation and the sound radiation of technical installations (if necessary, with allocation) +20
- Airborne sound insulation of wall and ceiling constructions +20
- Impact (footfall) sound insulation of ceiling structures, stairs +20
- Airborne sound insulation against outside noise +20
- building services systems +20

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPI) include communicating various sound insulation values.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Airborne sound insulation against other rooms (calculation method corresponds to Level(s) indicator 4.4: Acoustics and protection against noise, level 2 [T&D_02])	[dB]
KPI 2	Footfall sound insulation for dividing ceilings (horizontal/vertical) (calculation method corresponds to Level(s) indicator 4.4: Acoustics and protection against noise, level 2 [T&D_02])	[dB]
KPI 3	Airborne sound insulation against external noise (over-fulfilment) (calculation method corresponds to Level(s) indicator 4.4: Acoustics and protection against noise, level 2 [T&D_02])	[dB]
KPI 4	Airborne sound insulation against building technology (over-fulfilment) (calculation method corresponds to Level(s) indicator 4.4: Acoustics and protection against noise, level 2 [T&D_02])	[dB]

Synergies with DGNB system applications

- **DGNB OPERATION:** Achieving good acoustic comfort via a good sound insulation (Buildings in use [BIU] criterion SOC9.1) is indirectly assessed positively for the evaluation of the user satisfaction.
- **DGNB RENOVATED BUILDINGS:** High synergies with criterion TEC1.2 in the REN scheme.
- **DGNB DISTRICT:** In schemes UD and BD, road traffic noise, noise in open spaces and industrial noise are assessed in criterion SOC1.9. This can be used as a basis for noise insulation requirements for buildings.
- **DGNB INTERIORS:** Criterion PRO1.1 establishes an incentive for taking sustainability aspects of the sound insulation into account as well when choosing rental spaces.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

–

II. Additional explanation

As long as sound insulation is over and above the minimum requirements of DIN 4109, it is evaluated positively. Sound insulation measures should however still remain within a reasonable extent. Hence this criterion assesses whether requirements for sound insulation towards third party living and work spaces are met.

Retrospective improvements to sound insulation on existing structures are not possible or only possible to a limited extent. Therefore, decisions in the project development and planning phase are essential for the eventual fulfilment of sound insulation requirements.

III. Method

Assessment of the sound insulation quality of the building components is based on the sound insulation documentation referring to the requirements of DIN 4109 and Supplement 2 of DIN 4109 whereby following aspects have to be considered:

- Airborne sound insulation against noise from residential and work rooms, within their own areas and in other areas (walls, doors, ceilings)
- Footfall sound insulation against noise from residential and work rooms, within their own areas and in other areas (separating ceilings, staircases, landings)
- Airborne sound insulation against external noise (such as traffic noise)
- Airborne sound insulation against noise from building services installations (water installations, other building services)

Compliance with the requirements must be verified by providing mathematical documentation of the sound insulation and assessing the level of sound insulation provided by the planned components. All components must meet the relevant requirements. Sound insulation must be measurable during the construction. The calculation and documentation processes are based on the calculation methods from commonly recognised regulations.

IV. Usage-specific description

Assembly buildings

For the assessment in this criterion, assembly buildings are divided into the following building types:

- Type I: Congress buildings, cultural and civic centres, libraries;
- Type II: Theatres and concert halls, trade fair and city halls, museums;

Note: Assembly buildings that are not listed above as a building type can be assigned to one of the building types. If an assignment is not possible, we ask for direct communication with the DGNB office.

Indicator 1: Airborne sound insulation between rooms

Indicator 1.1: Within its own area– Partition walls R'_w and internal doors (from corridor to the dwelling or hotel room) R_w

Office

For this scheme, evaluation is done differently for rooms in their own areas and in other areas. For the evaluation of airborne sound insulation for walls and doors in the same area, a distinction is drawn between low requirements and higher requirements:

- Low requirements: Must generally be applied.
    - Higher requirements: Higher requirements pertain to, for instance, insulation between meeting and conference rooms, in offices for executives or adjacent rooms with different uses. In the case of doors in partition walls between rooms that require protection, the total sound reduction index for the doors and walls must generally be documented in accordance with the requirements for the partition wall (if these requirements cannot be implemented, a justification must be submitted as part of the verification process).

Indicator 1.2: Partition walls R'_w and doors R_w

Office

Insulation against noise from other areas – partition walls R‘w

The minimum requirements in accordance with DIN 4109 apply for other areas. Over-fulfilment of the minimum requirements is evaluated positively.

Hotel

Partition walls R’w (between hotel rooms) and doors Rw (from hotel rooms to corridors)

The requirements of DIN 4109 apply as a minimum for partition walls between hotel rooms, and for hotel room doors which connect to corridors. Over-fulfilment of the minimum requirements is evaluated positively.

Education

Insulation against noise from classrooms

For partition walls and doors in classrooms, the requirements in accordance with DIN 4109 for "schools and comparable educational establishments" apply for office and meeting rooms as per the requirements in accordance with Supplement 2 to DIN 4109, Table 3. Over-fulfilment of the requirements between normal classrooms by 3 dB and for increased requirements for office partition walls with normal activities is evaluated positively.

Please note: For classrooms with very high requirements (music and lecture halls), over-fulfilment of the objective by 3 dB is generally not feasible. In this case, it can generally be recognised as an over-fulfilment of 3 dB for partition walls between (normal) classrooms.**1.3 Separating ceilings R'_w**

Office

Separating ceilings in its own area and other areas R‘w

For separating ceilings in its own area and other areas, the requirements specified in the indicator apply as a minimum.

Education **Hotel**

Separating ceilings and ceilings R‘w (between hotel rooms)

The minimum requirements in accordance with DIN 4109 apply for separating ceilings and ceilings of hotel rooms and classrooms. Over-fulfilment of the minimum requirements is evaluated positively.**1.4 Standard sound level difference** $R_{l,w,R}$ or $D_{n,f,w,R}$

The standard sound level difference or the linear sound reduction measurement are important parameters for assessing flexible office room design. If the $R_{L,w,R}$ or $D_{n,f,w,R}$ meets the increased requirements for all flanking components (floor, ceiling, façade) for each partition wall grid, this is evaluated positively.

Indicator 2: Footfall sound insulation

Indicator 2.1: Footfall sound insulation of dividing ceilings and stairs

Rooms in their own areas and in other areas are taken into account differently in this scheme.

Office **Education** **Hotel**

In its own area (use of the same building)

For the evaluation of the footfall sound insulation of dividing ceilings and stairs in the same area, different requirements apply regarding the evaluated $L'_{n,w}$ – horizontal and $L'_{n,w}$ – vertical standard footfall sound levels.

Insulation against noise from other areas (insulation against noise from other usages and from leasing of space)

The minimum requirements in accordance with DIN 4109 apply for evaluating the footfall sound insulation of dividing ceilings and stairs against other areas. Implementation of increased sound insulation in accordance with Supplement 2 to DIN 4109 or the over-fulfilment of the same are evaluated positively.

Indicator 3: Airborne sound insulation

Indicator 3.1: Airborne sound insulation against external noise

Office **Education** **Hotel**

The requirements in accordance with DIN 4109 apply for the evaluation of airborne sound insulation against external noise.

Airborne sound insulation against external noise that is 3 dB better than the requirements of DIN 4109 or documentation of better airborne sound insulation taking into account the spectrum adaptation value for traffic noise (C_{tr} in accordance with DIN 717) in the frequency range of 100 to 5000 Hz is evaluated positively. The spectrum adaptation value only applies to transparent components (windows).

If there is significant noise pollution from external noise (above significant threshold of > 66 dB(A)), ventilation that is not reliant on windows is necessary for the proper evaluation of the sub-target value and target value.

This generally means that a mechanical ventilation system is required.

Indicator 4: Airborne sound insulation against noise from building services installations (water installations, other building services)

Airborne sound insulation against building services installations

Office **Education** **Hotel**

The requirements of DIN 4109 apply as a minimum for airborne sound insulation against noise from building services installations (water installations, other building services). Over-fulfilment of the minimum requirements is evaluated positively.

Indicator 5: Sound insulation in residential buildings

Sound insulation requirements

Residential

For new buildings, a distinction is made between five sound insulation classes:

- Class A*: Residential unit with very good sound insulation that enables residents to live undisturbed with almost no need to worry about disturbing neighbours.
- Class A: Residential unit with very good sound insulation that enables residents to live undisturbed without significant need to worry about disturbing neighbours. Increased sound insulation in semi-detached and terraced houses.
- Class B: Residential unit with good sound insulation that provides residents with peace and quiet, and largely ensures their privacy, given a mutual consideration among neighbours.
- High sound insulation in apartment buildings.
- Normal sound insulation in semi-detached and terraced houses.
- Class C: Residential unit with noticeably better sound insulation than Class D, generally providing residents with peace and quiet and ensuring their privacy with normal, considerate living behaviour.
- Increased sound insulation in apartment buildings.
- Class D: Residential unit with sound insulation that largely meets the requirements in accordance with DIN 4109:2018-01 for multi-storey buildings with apartments and work rooms, and thereby protects residents in common rooms against excessive nuisance due to sound transmission from other residential units and from the outside, for the purposes of health protection. It cannot be expected that noises from other residential units or from the outside are inaudible anymore. As a result, mutual consideration is required to prevent excessive noise. These requirements assume that unusually loud noises are not produced in neighbouring rooms.
- Normal sound insulation in apartment buildings.

Sound insulation in the same living space:

- Class EW1: Sound insulation in the same living space, where privacy cannot be expected.
- Class EW2: Sound insulation in the same living space, where a minimum level of privacy can be ensured and significant disturbances are prevented.
- Class EW3: Sound insulation in the same living space, where privacy can be ensured and disturbances are prevented.

A sound insulation certificate based on the multi-stage sound insulation concept enables simple classification of the sound insulation of entire residential units or entire buildings. The sound insulation certificate provides people involved in the planning process and in particular users (buyers, residents) with a simple, understandable and user-oriented evaluation. This enables all persons involved in the construction process to come to a mutual, well-informed agreement on a desired sound insulation level. The overall classification of the structural sound insulation into a quality class may at most be one class better than the worst evaluation of any of the criteria.
The sound insulation certificate can be issued for an entire house as well as for individual residential units within a building. The latter option enables specific classification of residential units on the basis of their location within the building and taking into account different construction designs, particularly for mixed uses.

The sound insulation certificate for a residential unit must always be created on the basis of the least favourable situation in terms of noise. When using values from forecast calculations or measurements, the least favourable value must be taken into account for each criterion.

If certificates are to be issued for all apartments in a building, at least 80% of the apartments must meet the requirements for the intended class, and 20% of the apartments may be no more than one class lower than the intended class. The points awarded for structural sound insulation are then determined using the average value of all apartments evaluated in the building.

Indicator 6: Sound insulation for special building types

Assembly buildings

In order to comply with the building scheme relevant sound insulation requirements, suitable planning in the early service phase is crucial. The basis for this planning is the project-specific noise protection concept, where the following aspects have to been considered:

- Indoor noise level, consideration through the structural sound insulation and the sound radiation of technical installations (if necessary, with allocation):
  A low level of background noise is essential for the music events and good speech intelligibility. The background noise level of on-site noises (external noises, noises from neighbouring rooms, from building services and sanitary installations as well as permanently installed media technology devices) should be defined and allocated between the planning disciplines.
- Airborne sound insulation of wall and ceiling constructions:
  The airborne sound insulation of the construction components is to be measured depending on the need for protection of the adjacent rooms.
- Impact (footfall) sound insulation of ceiling structures, stairs:
  Impact sound insulation of the construction components is to be measured depending on the need for protection of the adjacent rooms.
- Airborne sound insulation against outside noise:
  The airborne sound insulation of the external components is to be in compliance with the DIN 4109 (Appendix 1) or equivalent standard for measurement/calculation e.g. EN 12354-1
- building services systems:
  Due to the operation of building services systems (e.g. ventilation devices, heating systems, lift systems, sanitary facilities, etc.), the sound pressure levels specified in DIN 4109, for specified areas/rooms, must not be exceeded.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements

- Documentation that the acoustic requirements in accordance with the relevant evaluation level are complied with by referencing critical details of the construction (sound insulation documentation required under construction law).
- Clear presentation of the results for airborne sound insulation, comparing the values achieved with the minimum requirements in accordance with DIN 4109, which is used as a basis for over-fulfilment where applicable
- Construction plan for the documented components with associated values
- Mathematical sound insulation documentation in accordance with DIN 4109
- Measurement-based test certificates

The values must be clearly marked in the documentation and assigned to the corresponding indicators.

Documentation of compliance must be provided during the planning phase via mathematical documentation in accordance with DIN 4109. Compliance with the project planning values must be documented via measurements taken randomly at critical locations.

The parameters required for calculation can be found in the following documents:

- Sound insulation documentation

Please note:
Completed measurement results are evaluated in the criterion "PRO2.2 – Quality assurance of the construction".
In order to use a measurement-based documentation to demonstrate the compliance of standard components with the requirements, at least two measurements must be carried out per standard component. Documentation: measurement and test reports.

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
all	General and evaluation: scheme “assembly buildings” has been added	16.09.2021
491	Sustainability reporting: KPI 1-4 on EU taxonomy compliance has been completed	16.09.2021
all	Evaluation and method: Indicator 6 “Sound insulation for special building types” has been added	16.09.2021

II. Literature

- DIN 4109: 2016-07 and 2018-01. Sound insulation in buildings, incl. Supplements 1 and 2. Berlin: Beuth Verlag

Supplementary literature:

- DIN 45680. Measurement and assessment of low-frequency noise immissions in the neighbourhood. Berlin: Beuth Verlag. March 1997
- DIN 45680 Supplement 1. Measurement and assessment of low-frequency noise immissions in the neighbourhood - Guidelines for the assessment for industrial plants. Berlin: Beuth Verlag. September 2013
- DIN EN 12354. Estimation of acoustic performance of buildings from the performance of elements. Berlin: Beuth Verlag. December 2000
- DIN EN ISO 16283-1:2014-11 Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation;
- DIN EN ISO 16283-2:2016-05 Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 2: Impact sound insulation (ISO 16283-2:2015);
- DIN EN ISO 16283-3:2017-09 – Draft; Acoustics – Field measurement of sound insulation in buildings and of building elements – Part 2: Impact sound insulation
- DIN EN ISO 717 2013-06 Rating of sound insulation in buildings and of building elements. Berlin: Beuth Verlag.
- DIN EN ISO 10052. Acoustics – Field measurements of airborne and impact sound insulation and of service equipment sound – Survey method. Berlin: Beuth Verlag. October 2010
- DIN EN ISO 16032. Acoustics – Measurement of sound pressure level from service equipment in buildings – Engineering method. Berlin: Beuth Verlag. December 2004
- Sixth General Administrative Regulation to the Federal Immission Control Act (Technical instructions on protection against noise (TA Lärm)), published 1998
- VDI 4100: 2012-10 Sound insulation in dwellings
- STEP GmbH: "Schallschutz bei Wohnungstreppen – Ein Handbuch über den Trittschallschutz von Leichtbautreppen im Wohnungsbau" [Sound insulation for residential staircases – A manual for the footfall sound insulation of lightweight staircases in residential construction], first edition, 2007, ed. Treppenmeister GmbH

APPENDIX 1

Requirements in accordance to the DIN 4109

Airborne sound insulation against outside external noise

„Relevant external noise level“ in dB	Room types		
	Bedded rooms in hospitals and sanatoriums	Sitting rooms in apartment, overnight stays rooms in accommodation establishments, teaching rooms und similar	Office spaces and similar
	R'_w total of outdoor components in dB		
to 55	35	30	—
56 to 60	35	30	30
61 to 65	40	35	30
66 to 70	45	40	35
71 to 75	50	45	40
76 to 80	b	50	45
> 80	b	b	50

Maximum permissible A-evaluated sound pressure level in protection required external rooms, generated by technical buildings equipment and structurally with the building related usageColumn	1	2	3	4
Row	Noise sources		Maximum permissible A-evaluated sound pressure level dB	
			Living spaces and bedrooms	Teaching- und workrooms
1	Sanitary equipment/water installations (Water supply and wastewater system collectively)		L_{AF},max,n ≤ 30[a,b,c]	L_{AF},max,n ≤ 35 [a,b,c]

2	Other in-house appliances, permanently installed sound sources of technical equipment, Supply and disposal like garage facilities		L_{AF},max,n ≤ 30[c]	L_{AF},max,n ≤ 35[c]
3	Restaurants including kitchens, Sales outlets, business places and similar.	Days from 6:00 until 22:00	*L*r ≤ 35 L_{AF},max ≤ 45	*L*r ≤ 35 L_{AF},max ≤ 45
4		Nights until 6:00	*L*r ≤ 25 *L*AF,max ≤ *35*	*L*r ≤ 35 *L*AF,max ≤ *45*

a single short-time noise spikes, which generated when water taps and devices are actuated according to the table 11 (opening, closing, switching, interrupting) , are currently not considered.

b requirements for the fulfillment of the permissible sound pressure level:
— The execution documentation must regard the requirements of Sound insulation, i. e. For the construction components the required sound proofs must be available;
— In addition, the responsible construction company must be named and for a partial decrease before closing or cladding of the installation must be consulted.
c Deviating from DIN EN ISO 10052: 2010-10, 6.3.3, is dispensed with measurement in the loudest room corner (see also DIN 4109-4).

Requirements for Maximum permissible A-evaluated sound pressure level in protection required rooms, in the same apartment, generated by air conditioning systems in the same living area

Column	1	2	3
Row	Noise sources	Maximum permissible A-evaluated sound pressure level dB	
		Living spaces and bedrooms	Kitchen
1	Permanently installed sound sources of air conditioning systems in the same living- and workspace	*L*AF,max,n ≤ 30[a,b,c,d]	*L*AF,max,n ≤ 33[a,b,c,d]

a single short-time noise spikes , which generated when the systems are switched on and off, may exceed a maximum of 5 dB.

b requirements for the fulfillment of the permissible sound pressure level:
— The execution documentation must regard the requirements of Sound insulation, i. e. For the construction components the required sound proofs must be available;
— In addition, the responsible construction company must be named and for a partial decrease before closing or cladding of the installation must be consulted.
c Deviating from DIN EN ISO 10052: 2010-10, 6.3.3, is dispensed with measurement in the loudest room corner (see also DIN 4109-4).

d It is allowed by 5 dB higher values, if it is continuous noises without noticeable single tones.

TEC1.3

Quality of the building envelope

Objective

Our objective is to minimise the energy demand for air conditioning in buildings while at the same time ensuring high thermal comfort and preventing building damage.

Benefits

A well-planned building envelope is a prerequisite for achieving high user comfort and low energy costs.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO GERMAN SUSTAINABILITY STRATEGY	
Significant	7.3	energy efficiency	7.1.a	Resource conservation
Moderate	8.4	Improve resource efficiency in consumption and production	7.1.b 8.1	Resource conservation Resource conservation
	12.2	Sustainable management and use of natural resources		

Outlook

The different levels of quality of the building envelope defined in the criterion will be adjusted to correspond to technical and, potentially, legislative developments in the medium term.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	**2.5%**	**4**
Consumer market **Shopping centre**	**2.1%**	**3**
Department stores		
Logistics **Production**	**2.7%**	**4**
Assembly buildings	**2.6%**	**4**

EVALUATION

The quality of the building envelope is evaluated using four indicators, which are intended to create the conditions required to ensure high thermal comfort with the lowest possible energy demand. The heat transfer coefficients (indicator 1), existing thermal heat bridges (indicator 2), airtightness (indicator 3) and summer heat protection (indicator 4) are evaluated depending on the specific use. In this criterion, a maximum of 100 points, or a maximum of 105 points including bonuses, can be achieved.

NO.	INDICATOR		POINTS
1	**Heat transfer**		
1.1	**Heat transfer coefficients**		
	Evaluation of the indicator is not possible (see Appendix A Detailed description)		**0**
	Office **Education** **Shopping centre** **Department stores** **Logistics** **Production** **Hotel** **Assembly buildings**	W/(m²·K)	**Max. 40**
	Consumer market		**Max. 45**
	Opaque exterior components *	≤ min. country	**20**
	Transparent exterior components *	specific	
	Curtain wall	mandatory	
	Glass roofs, strip lights, skylights	requirement	
	Opaque exterior components *	-15% of the	**30**
	Transparent exterior components *	min.	
	Curtain wall	mandatory	
	Glass roofs, strip lights, skylights	U-Value	
	Opaque exterior components *	-30% of the	**40**
	Transparent exterior components *	min.	
	Curtain wall	mandatory	
	Glass roofs, strip lights, skylights	U-Value -	
	For: **Consumer market**		**45**

Note for **Logistics** **Production** :
Building areas with the low heating levels must be evaluated via indicator 1.3

Alternative: if no mandatory regulation exists, U-Values from **Appendix 1** can be used as min. requirements for the Heat transfer coefficients.

1.2	**Maximum value for the specific transmission heat loss H'_T**		
	Residential	W/(m²·K)	**Max. 40**
	Freestanding A_N < 350 m² of the façade area	≤ min. country	**20**
	Freestanding A_N > 350 m² of the façade area	specific	
	Semi-detached	mandatory	
	Other	requirement	

Freestanding A_N < 350 m² of the façade area Freestanding A_N > 350 m² of the façade area Semi-detached Other	-15% of the min. mandatory U-Value	**30**
Freestanding an < 350 m² of the façade area Freestanding an > 350 m² of the façade area Semi-detached Other	-30% of the min. mandatory U-Value	**40**

Alternative: if no mandatory regulation exists, U-Values from **Appendix 1** can be used as min. requirements for the specific transmission heat loss.

1.3 **Heat transfer coefficients**

Logistics **Production** W/(m²·K) **Max. 40**

The following U-values apply to the exterior components of building areas with low heating levels (target indoor air temperature between 12 °C and 19 °C).

Opaque exterior components * Transparent exterior components * Curtain wall Glass roofs, strip lights, skylights	≤ min. country specific mandatory requirement	**20**
Opaque exterior components * Transparent exterior components * Curtain wall Glass roofs, strip lights, skylights	-15% of the min. mandatory U-Value	**30**
Opaque exterior components * Transparent exterior components * Curtain wall Glass roofs, strip lights, skylights	-30% of the min. mandatory U-Value	**40**

Alternative: if no mandatory regulation exists, U-Values from **Appendix 1** can be used as min. requirements for the Heat transfer coefficients.

* If not included in the components curtain wall, glass roofs, strip lights and skylights.

Note: Results of a detailed calculation may be interpolated.

NO.	INDICATOR		POINTS
2	**Thermal heat bridges**[1]		
2.1	**Thermal heat bridge correction factors**		
	Evaluation of the indicator is not possible		0
	Office **Education** **Residential** **Hotel** **Assembly buildings**	W/(m²·K)	**10–15**
	Thermal heat bridge correction factor ΔU_{WB} in W/(m²·K)	≤ 0.05	10
		≤ 0.02	15
	Consumer market **Shopping centre** **Department stores**	W/(m²·K)	**5–15**
	Thermal heat bridge correction factor ΔU_{WB} in W/(m²·K)	≤ 0.1	5
		≤ 0.05	10
		≤ 0.02	15
	Logistics **Production**	W/(m²·K)	**10–30**
	Thermal heat bridge correction factor ΔU_{WB} in W/(m²·K)	0.1	10
		≤ 0.05	20
		≤ 0.02	30
	Note: Results of a detailed calculation may be interpolated.		

NO.	INDICATOR		POINTS
3	**Airtightness**		
3.1	**Airtightness measurement**		
	Air exchange rate (at a pressure difference of 50Pa) n50 in h-1		
	Note for the point calculation: a linear interpolation is possible (n50-value)		
	Office **Education** **Residential** **Hotel** **Assembly buildings**		**Max. 15**
	Buildings – interior volume ≤ 1500 m³	n_{50} ≤ 1.5	5
	Buildings – interior volume > 1500 m³ applies additionally:		
	Air exchange from external surfaces	q_{50}: 2,5	
	Buildings – interior volume ≤ 1500 m³	n_{50} ≤ 1.0	10
	Buildings – interior volume > 1500 m³ applies additionally:		
	Air exchange from external surfaces	q_{50}: 2,0	
	Buildings – interior volume ≤ 1500 m³	n_{50} ≤ 0.6	15
	Buildings – interior volume > 1500 m³ applies		

[1] Adaptation possible, project specific values must be agreed with DGNB in the project adaptation process. The local code/standard may be used as a reference value

additionally:		
Air exchange from external surfaces	q_{50}: 1,8.	
Consumer market		**Max. 25**
Buildings – interior volume ≤ 1500 m³	$n_{50} \leq 1.5$	10
Buildings – interior volume > 1500 m³ applies additionally:		
Air exchange from external surfaces	q_{50}: 2,5	
Buildings – interior volume ≤ 1500 m³	$n_{50} \leq 1.0$	15
Buildings – interior volume > 1500 m³ applies additionally:		
Air exchange from external surfaces	q_{50}: 2,0	
Buildings – interior volume ≤ 1500 m³	$n_{50} \leq 0.6$	25
Buildings – interior volume > 1500 m³ applies additionally:		
Air exchange from external surfaces	q_{50}: 1,8	
Department stores **Shopping centre**		**Max. 30**
Buildings – interior volume ≤ 1500 m³	$n_{50} \leq 1.5$	10
Buildings – interior volume > 1500 m³ applies additionally:		
Air exchange from external surfaces	q_{50}: 2,5	
Buildings – interior volume ≤ 1500 m³	$n_{50} \leq 1.0$	20
Buildings – interior volume > 1500 m³ applies additionally:		
Air exchange from external surfaces	q_{50}: 2,0	
Buildings – interior volume ≤ 1500 m³	$n_{50} \leq 0.6$	30
Buildings – interior volume > 1500 m³ applies additionally:		
Air exchange from external surfaces	q_{50}: 1,8	

Not applicable for **Logistics** **Production**

3.2 Joint permeability of windows and doors

Office **Education** **Residential** **Hotel**
Assembly buildings

Joint permeability Q in accordance with DIN EN 12207	**Max. 15**
■ Class 2	5
■ Class 3	10
■ Class 4	15

Not applicable for **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production**

NO.	INDICATOR		POINTS
4	**Summer heat protection**		
4.1	**Simplified method**		
	Office **Education** **Residential** **Consumer market** **Hotel** **Assembly buildings**		
	Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter.	S ≤ x $Shp_{,max}$	**5–15**
		x = 1	5
		x = 0.8	**15**
	Logistics **Production**		
	Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter.	S ≤ x Shp,	**10–30**
		x = 1	10
		x = 0.8	30
	Department stores **Shopping centre**		
	Compliance with minimum national criteria to avoid overheating in summer, or with MIN_FAC*, whichever is stricter.	S ≤ Shp	**15**
	Alternative (documentation according to DIN 4108-2:2013) Simulation		
	Office **Education** **Residential** **Consumer market** **Hotel** **Assembly buildings** **Department stores** **Shopping centre**		
	number of overheating / excess temperature hours	≤ x Kh/a	**5 – 15**
		x = 500	5
		x = 350	15
	Logistik **Produktion**		
	number of overheating / excess temperature hours	≤ x Kh/a	**10 – 30**
		x = 500	10
		x = 350	30

***Note: Definition of MIN_FAC see Table 2 under the Appendix 1**

4.2	**AGENDA 2030 BONUS – CLIMATE ADAPTATION** Resilient thermal comfort: The frequency of exceeding during the heating and cooling period is determined for buildings using climate data predictions for 2030 and 2050. The results are used in the decision-making process at the planning stage.	**+5**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPI) include communicating information regarding heat transfer coefficients, thermal heat bridge correction factors, the results of the airtightness measurement, solar transmittance parameters and, if necessary, the number of exceeding temperature hours. The results of a thermal simulation can be used for reporting in accordance with the "Level(s) – Common EU framework of core environmental indicators"(for more details see chapter “Terms and Definitions”).

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Heat transfer coefficients, differentiated by different exterior components	[W/m²*K]
KPI 2	Thermal heat bridge correction factors	[W/m²*K]
KPI 3	Air exchange rate	[1/h]
KPI 4	Solar transmittance parameter	[-]
KPI 5	Number of exceeding temperature hours, corresponds to Level(s) indicator 4.2: Time outside of thermal comfort range – Time out of range	[kh/a]
KPI 6	Number of exceeding temperature hours in 2030 and 2050, corresponds to Level(s) indicator 5.1: Time outside of thermal comfort range – Time out of range 2030/2050	[kh/a]

Synergies with DGNB system applications

- **DGNB RENOVATED BUILDINGS:** Synergies exist with criterion TEC1.3 in the scheme for the renovated buildings.
- **DGNB INTERIORS:** Criterion PRO1.1 establishes an incentive for taking sustainability aspects of thermal comfort into account as well when choosing rental spaces.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

–

II. Additional explanation

–

III. Method

The required values are defined below and serve as comparison values for the implemented design. The following methods are used for the evaluation of the implemented design:

Indicator 1: Transmission and diffusion via envelope surface components
This indicator is evaluated based on the selected energy performance certificate (EPC) for more details regarding the EPC refer to the criterion ENV1.1 and [T&D_03]. The worst average value must be used for the evaluation in each case.

Indicator 1.1: Diffusion via envelope surface components
In order to prevent damage in the long term, the building envelope must always be designed to ensure that only non-critical amounts of condensation water occur in the envelope surface components. Verification is carried out via an informal declaration by the specialist planner. If the specialist planner does not classify structural components as fundamentally non-critical, documentation of the vapour diffusion must be carried out for these components using static or dynamic calculation. This also applies to enveloping surfaces of building zones with highly different indoor climates
(e.g. cold storage rooms). If this verification is not carried out, no points can be awarded in this indicator.

Indicator 1.2: Transmission via envelope surface components
When calculating the average value of each component category (no. 1–4, see evaluation), the components must be taken into account based on the proportion of the total area they represent. The heat transfer coefficients of components against unheated rooms or soil must additionally be weighted with a factor of 0.5. When calculating the average value of the floor slabs immediately adjacent to the soil, surfaces more than 5 m away from the outer edge of the building may be disregarded.

Indicator 2: Transmission via thermal heat bridges
Indicator 2.1: Minimum heat insulation on thermal heat bridges
The thermal heat bridges must always be designed to ensure that the structural minimum heat insulation (moisture protection) is complied with throughout the entire area to provide long-lasting protection against damage. Verification is carried out via an informal declaration by the specialist planner. If the specialist planner does not classify thermal heat bridges as fundamentally non-critical, a two-dimensional isothermal calculation must be carried out for these design details in accordance with the ISO 13788:2012 “Hydrothermal performance of building components and building elements”. If this verification is not carried out, no points can be awarded in this indicator. The thermal heat bridge correction factor ΔU_{WB} is determined in accordance with ISO 10211:2017 “Thermal bridges in building construction“.

Indicator 3: Airtightness of the building envelope
Indicator 3.1: Airtightness measurement
The measurement must include all building areas that are to be heated.

Buildings with an interior volume ≤ 1500 m³:

- Assessment of the air exchange rate n_{50} in H^{-1} at a pressure difference of 50 Pa in accordance with DIN EN 13829 (Method A or Method B).

For buildings with an interior volume > 1500 m³, the following also applies:

- Assessment of the air exchange from external surfaces q_{50} in accordance with DIN EN 13829 (Method A or Method B).

Indicator 3.2: Joint permeability of windows and doors
Documentation of the joint permeability Q in accordance with DIN EN 12207. The worst value of the components installed is used here. If there are differences in classes, deviations up to a 10% of the total area (area of the windows and doors) can be ignored.

Indicator 4: Summer heat protection
Documentation on summer heat protection must be carried out in accordance with the version of DIN EN 13363. As an alternative, documentation of the summer heat protection can be created in accordance with a newer version of ISO 52022-3:2017 standard.

Indicator 4.1: Simplified method
Assessment of the solar transmittance parameter S in the simplified calculation method of the solar and daylight characteristics for solar protection devices combined with glazing ISO 52022-1:2017. The documentation must include the rooms specified as relevant in the valid version of the EPC.

Alternative: **simulation**
If it is not possible to carry out documentation in accordance with the simplified method, a dynamic thermal simulation calculation can be carried out to assess the number of exceeding temperature hours for the purposes of evaluating the thermal conditions. This applies in particular if rooms or spatial areas suitable for the assessment exist in conjunction with the following structural facilities:

- Double façades or
- Transparent thermal insulation (TTI) systems.

In such cases, the thermal simulation must be carried out with consistent calculation boundary conditions in accordance with the norms described in criterion ENV1.1.

Indicator 4.2: Agenda 2030 bonus: Thermal comfort climate adaptation
The frequency of exceeding during the heating and cooling period is determined for buildings using climate data predictions for 2030 and 2050. The results are used in the decision-making process at the planning stage. The climate data used should be based on the UN IPCC "Mitigation" (SRES E1) emissions scenario. The "Medium-high" (SRES A1B) emissions scenario can be used as a second "worst-case scenario". Information regarding the assessment methodology and the possible areas of focus in the planning process can be found in the "Level(s) framework" published by the European Commission (Source: "Level(s) – A common EU framework of core sustainability indicators for office and residential buildings", Draft Beta v1.0, Brussels, August 2017).

IV. Usage-specific description

Assembly buildings

Evaluation of the seasonal / irregularly used buildings i.e. buildings which are not operating the whole year, such as exhibition halls, will be performed only for operational (in use) time, without consideration of the building's vacant periods.

Appendix 1: Worldwide climatic zones and U-Values for orientation

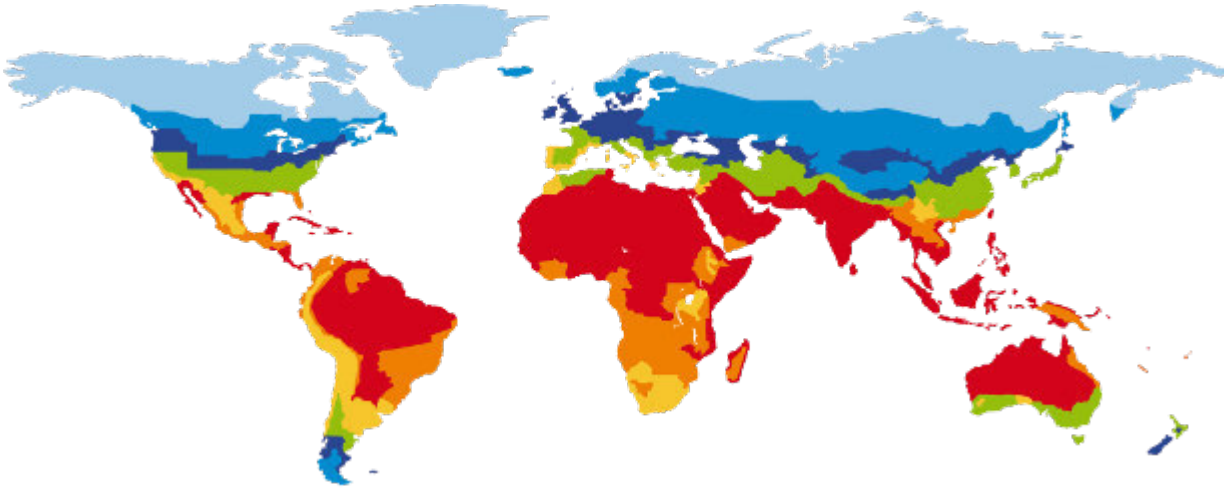

Figure 1: World climate map according to the Passive House Institute (PHI)

DGNB offers the PHI climate map with certain U-Values as an alternative solution for the regions and countries where no mandatory regulations exist. The following 7 climatic zones are considered as the most influential zones:

- Arctic
- Cold
- Cool, temperate
- Warm, temperate
- Warm
- Hot
- Very hot

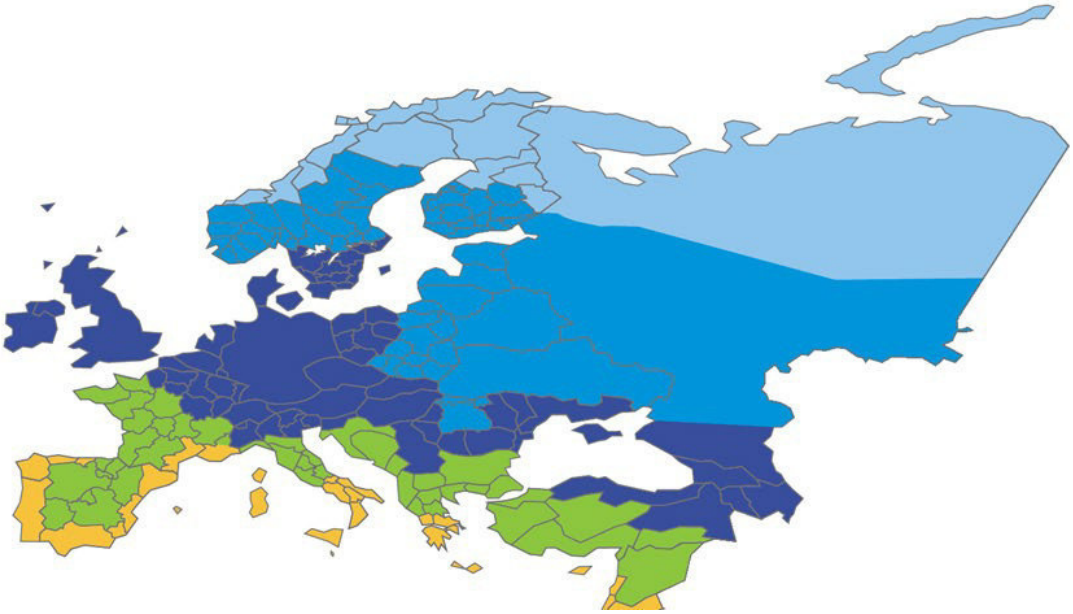

Figure 2: Climate map of Europe (source: PHI)

Table 1: Optional **U - Values** (minimum requirement) for the various climatic zones

	Climate Zones:						
	Arctic	Cold	Cool, temperate	Warm, temperate	Warm	Hot	Very hot
Heat transfer Non-residential W/(m²·K)							
Opaque exterior components	0.25	0.30	0.35	0.50	0.75	0.75	0.50
Transparent exterior components	0.90	1.30	1.70	2.00	2.30	2.30	2.00
Curtain wall	0.90	1.30	1.70	2.00	2.30	2.30	2.00
Glass roofs, skylights etc.	1.50	2.00	2.80	3.00	3.30	3.30	3.00
Transmission heat loss H'_T Residential W/(m²·K)							
Freestanding A_N < 350 m² of the façade area	0.35	0.40	0.45	0.60	0.90	0.90	0.60
Freestanding A_N > 350 m² of the façade area	0.45	0.50	0.55	0.80	1.20	1.20	0.80
Semi-detached	0.40	0.45	0.50	0.70	1.10	1.10	0.70
Other	0.50	0.60	0.70	1.05	1.50	1.50	1.05
Heat transfer (indoor air temperature between 12 °C and 19 °C) Logistic/Production W/(m²·K)							
Opaque exterior components	0.40	0.50	0.55	0.80	1.20	1.20	0.80
Transparent exterior components	1.65	2.35	3.00	3.50	4.00	4.00	3.50
Curtain wall	1.70	2.40	3.30	3.70	4.10	4.10	3.70
Glass roofs, skylights etc.	1.90	2.50	3.40	3.90	4.25	4.25	3.90

Table 2: Definition of MIN_FAC

	MECHANICALLY HEATED BUILDING (OFFICES AND SIMILARLY USED SPACES)	BUILDING WITHOUT ACTIVE COOLING OR WITHOUT AIR CONDITIONING
MIN_FAC	$S_{HP,} = W_{WR} \cdot g_t \leq 0.16 = S\ hp,_{max}$	$SHP = W_{WR} \cdot g_t \leq 0.16 = S\ hp,_{max}$

where:

W_{WR} is the window to wall ratio = window area / wall area

window area = sum of all windows (including window frames and mullions)

wall area = area of the exterior wall (width * floor to ceiling height) including all transparent and opaque parts of the wall

g_t is the combined total shading coefficient of window system, glazing and sun protection.

S_{HP} (Solar Heat Protection) is the factor to avoid overheating for office rooms according to DIN EN 13363

Alternative: Thermal, solar and daylight properties of building components and elements according to either detailed calculation method ISO 52022-3:2017 or Simplified calculation method of the solar and daylight characteristics for solar protection devices combined with glazing ISO 52022-1:2017.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements

Indicator 1: Transmission and diffusion via envelope surface components:

- Declaration by the specialist planner that there are non-critical amounts of condensation water in the envelope surface components, documentation of the vapour diffusion if necessary.
- List of the heat transfer coefficients for:
- Opaque exterior components
- Transparent exterior components
- Curtain wall
- Glass roofs, strip lights, skylights

Indicator 2: Transmission via thermal heat bridges

- Declaration by the specialist planner that the structural minimum heat insulation for thermal heat bridges has been complied with, documentation via isothermal calculations if necessary.
- Details of the selected thermal heat bridge correction factor ΔU_{WB}.
- Catalogue of the thermal heat bridges in accordance with DIN EN ISO 10211.

Indicator 3: Airtightness of the building envelope

- Documentation of the airtightness measurement results. Assessment of the air exchange rate n_{50} in h-1 and, if applicable, calculation of the air exchange from external surfaces q_{50} in m³/(h m²) at a pressure difference of 50 Pa in accordance with DIN EN 13829.
- Documentation of the joint permeability Q in accordance with DIN EN 12207 and details of the class calculated on the basis of the EPC.
- The details must be taken from the relevant technical data sheet for the windows and doors as test bench values.

Indicator 4: Summer heat protection:

- Documentation of the solar transmittance parameter S in accordance with DIN EN 13363 or ISO 52022-3:2017 and/or ISO 52022-1:2017.
- Dynamic thermal simulation with calculation boundary conditions in accordance with standards described in criterion ENV1.1.

Indicator 4.2: Agenda 2030 bonus: Thermal comfort climate adaptation

- Results of the thermal simulation/calculation which are done using climate data predictions for 2030 and 2050

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
all	General, evaluation and usage specific description: scheme “Assembly buildings” has been added	16.09.2021
500	Shares of total score have been corrected	16.09.2021
505	Indicator 4: alternative assessment option – simulation has been added	16.09.2021
509	Editorial: method, indicator 4.2 climate scenario name from UN IPCC has been corrected SRES A1B	16.09.2021

II. Literature

- ISO 13788:2012 Hydrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods Berlin: Beuth Verlag. May 2013
- ISO 10211:2017 Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations
- ISO 14683:2017 Thermal bridges in building construction - Linear thermal transmittance - Simplified methods and default values.
- DIN EN 15026. Hygrothermal performance of building components and building elements – Assessment of moisture transfer by numerical simulation. Berlin: Beuth Verlag. July 2007
- ISO 52022-3:2017Energy performance of buildings -- Thermal, solar and daylight properties of building components and elements -- Part 3: Detailed calculation method of the solar and daylight characteristics for solar protection devices combined with glazing
- ISO 52022-1:2017 Energy performance of buildings -- Thermal, solar and daylight properties of building components and elements -- Part 1: Simplified calculation method of the solar and daylight characteristics for solar protection devices combined with glazing
- DIN EN 13363-1:2007-09 Solar protection devices combined with glazing - Calculation of solar and light transmittance - Part 1: Simplified method; Beuth Verlag. Sep. 2007
- Sustainable Development Goals icons, United Nations/globalgoals.org
- World climate map according to the Passive House Institute (PHI): https://passiv.de/en/03_certification/01_certification_components/02_certification_criteria/01_transparentcomponents/01_transparentcomponents.html

TEC1.4

Use and integration of building technology

Objective

Our objective is to create a building concept plan with the best possible use of passive systems and incorporation of renewable energy sources for the required technical systems. In addition, the concept plan intends to ensure that the building can be adjusted to suit changing conditions of use or technical developments with the lowest possible effort, and that the technical systems used are integrated into the district.

Benefits

Reduced use of technical systems in the building can result in a reduction of faults during building operation. The use of resilient building technology and renewable energy sources reduces the risk of increased costs and external dependencies, and is generally engineered towards long-term durability.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO GERMAN SUSTAINABILITY STRATEGY	
Significant	12.2	Sustainable management and use of natural resources	7.1.b	Resource conservation
			7.2.a/b	Renewable energy
Moderate	7.1	Universal access to modern energy	7.1.a	Resource conservation
			8.1	Resource conservation
	7.3	Double the improvement in energy efficiency		
	8.4	Improve resource efficiency in consumption and production		
	9.4	Upgrade all industries and infrastructures for sustainability		

Outlook

This criterion is applied for the first time in version 2020. Revision of the content of this criterion in the near future may be possible.

Share of total score

	SHARE	WEIGHTING FACTOR
Office Education Residential Hotel	1.9%	3
Consumer market Shopping centre Department stores	2.1%	3
Logistics Production Assembly buildings	2.0%	3

EVALUATION

In order to encourage a reduction in the primary energy demand required for the technical systems, points are awarded for the use of passive systems via indicator 1. The systems for heat and cooling distribution are evaluated in indicator 2. The indicators for accessibility of the building technology (indicator 3) and integrated systems (indicator 4) exist to enable assessment of the requirements for future adjustment of the technical systems with the lowest possible effort. The latter indicator evaluates the extent to which the existing systems can be removed and integrated into higher-level systems and into the district. 10 points can be awarded in each case via two circular economy bonuses for the use of renewable energy sources from the district and for the provision of storage capacity.
A maximum of 100 points, or 120 points with bonuses, can be awarded for this criterion.

NO.	INDICATOR	POINTS
1	**Passive systems**	
1.1	**Planning for a passive building concept**	**10**
	Planning for a passive building concept designed to reduce the primary energy demand caused by the technical systems in building operation, containing at least five of the following aspects: ■ Arrangement and compactness of the building structure, proportion of window area, ■ Use of daylight (light redirection), ■ Use of solar output (passive), ■ Solar radiation protection, ■ Storage mass and insulation standard, ■ Natural ventilation, ■ Passive heating, ■ Passive cooling	
1.2	**Implementation of a passive building concept**	**Max. 20**
	Implementation of a passive building concept designed to reduce the primary energy demand caused by the technical systems during building operation.	
	■ For every aspect specified in 1.1	+2.5 each
2	**Adaptability of the distribution system to suit operating temperatures to enable the use of renewable energy**	
2.1	**Heat distribution and transfer system**	**1–7.5**
	■ Design of the heat transfer system for an average hot water temperature of ≥ 60 °C	1
	■ Design of the heat transfer system for an average hot water temperature of > 45 °C, < 60 °C	4
	■ Design of the heat transfer system for an average hot water temperature of ≤ 45 °C	7.5
	Please note: If the total demand of thermal energy (heating and cooling) is fully covered using renewable energy (in accordance with German Renewable Energies Heat Act (EEWärmeG)), the maximum total evaluation points can be awarded in this indicator, once a verification check on the approach has been carried out (see "Innovation area").	

2.2	**Cooling distribution and transfer system**	**1–7.5**
	■ Design of the cooling transfer system for an average cold water temperature of ≤ 14 °C	1
	■ Design of the cooling transfer system for an average cold water temperature of > 14 °C, < 19 °C	4
	■ Design of the cooling transfer system for an average cold water temperature of ≥ 19 °C	7.5

Please note: If the total demand of thermal energy (heating and cooling) is fully covered using renewable energy (in accordance with the German Renewable Energies Heat Act (EEWärmeG)), the maximum total evaluation points can be awarded in this indicator once a verification check on the approach has been carried out (see "Innovation area").

Re 2 **INNOVATION AREA** — **As in 2**

Explanation: If the systems used are supplied with 100% of their energy from renewable energy sources, the requirements of indicators 2.1 and 2.2 are considered to have been met. If there is no heating or cooling system in the building, the requirements of the corresponding indicator (2.1 or 2.2) are considered to have been met.

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3 Accessibility of the building technology

3.1	**Technical facilities/generation**	**10**

All components of the technical facilities are easily accessible for retrofitting and subsequent replacement. The technical facilities include an adequate number of sufficiently large installation openings, doors and corridors. Components can be transported and replaced without needing to make structural changes.

3.2	**Shafts/routes/distribution**	**Max. 10**
	■ Vertical shafts/routes for all construction tasks are adequately accessible.	5
	■ Vertical shafts/routes for all construction tasks are adequately accessible and conversion work can be carried out without significant disruption to the building operation.	10

Re 3 **INNOVATION AREA** — **As in 3**

Explanation: If energy storage is incorporated into the building and particular care is taken to ensure that it is easily accessible and can be easily adapted to future requirements, points can be awarded as appropriate for 3.1. Likewise, points can be awarded in accordance with 3.2 if particular care is taken to ensure that the transfer of energy to the rooms is easily accessible and can be easily adapted to future requirements.

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4 Integrated systems

4.1	**Condition and expandability of system integration**	**Max. 15**
4.1.1	Open and standardised protocols in existing networks	+10
4.1.2	Planning/implementation in accordance with DIN EN ISO 16484-1	+5
4.2	**Integrated functions in a higher-level system**	**Max. 10**
	Possible functions include (points per integrated element)	+1 each

- Access control, burglar alarm system, presence detection, weather station, solar radiation protection, glare protection, lighting, heating, ventilation, cooling, lift systems, energy management, sanitary systems, window contact.

The list of possible functions may be expanded.

4.3	**Integration of technical systems/media into the district/the immediate surroundings**	**Max. 10**
4.3.1	**Planning of integration of the technical systems/media into the district/the immediate surroundings** An integrated district-based energy concept has been planned with the objective of using synergies in relation to the district/the immediate surroundings. This concept contains at least three of the following elements: - Analysis of the existing energy potential and possible interlinking with existing energy infrastructure in the surrounding area - Creation of district-based energy balances for the building for heating, cooling and electricity - Comparison and environmental evaluation of the emissions of at least three decentralised and/or centralised heat supply variants - Economic evaluation (investments and operating costs) of different heat supply variants - Analysis of the supply of renewable energy to the district/the immediate surroundings, taking into account possible consumers	+5
4.3.2	**Implementation of integration of the technical systems/media into the district/the immediate surroundings** An integrated district-based energy concept has been implemented with the objective of using synergies in relation to the district/the immediate surroundings.	+5
4.4	**Integration of the energy infrastructure into the district/the immediate surroundings**	
4.4.1	**CIRCULAR ECONOMY BONUS – DISTRICT SOLUTION FOR RENEWABLE ENERGY** Explanation: Energy generated from renewable energy sources in the surrounding district/the immediate surroundings is consistently used in the building to cover the building-related or user-related energy demand (at least 10% of the building-related final energy demand). Alternatively, energy generated in the building or on the premises using renewable energy sources is transferred to the district/the immediate surroundings (at least 10% more than the building-related final energy demand).	+ 10
4.4.2	**CIRCULAR ECONOMY BONUS – GRID-COMPATIBLE ENERGY SYSTEM** Explanation: The building provides a significant amount of storage capacity (approximately 10% in terms of the final energy demand of the building) for the purposes of grid compatibility or uses integrated energy and load management.	+ 10

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPI) include communicating the design temperatures, the proportion of energy demand covered by renewable energy from the district and the storage capacities.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Hot water/cold water design temperature	[°C]
KPI 2	Proportion of the building-related final energy demand covered by renewable sources from the district	[%]
KPI 3	Storage capacities of the building (grid compatibility)	[kWh/ time]

Synergies with DGNB system applications

- **DGNB RENOVATED BUILDINGS:** This criterion has similarities with the criterion TEC1.4 in the renovated buildings scheme.
- **DGNB DISTRICT:** This criterion has similarities with the criterion TEC2.1 in the UD and BD schemes.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Technical systems are some of the components of a building that are most rapidly affected by change; at the same time, they have a significant effect on the functional ability of a building. The basic use of technology and selection of the appropriate building technology – particularly in terms of the building technology – therefore plays an important role in the sustainability of a building.

System integration, high adaptability of technical systems (i.e. enabling them to be easily adjusted to suit changing conditions) and district integration are crucial criteria, and can significantly affect the user's acceptability of a building during its lifetime, as well as the operating costs. The objective must therefore be to plan and construct current buildings in such a way as to allow for easy adjustments in the future.

II. Additional explanation

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III. Method

The technical systems should be assessed for the following elements of cost Structure – services

- Sewerage, water and gas systems
- Heat supply systems
- Air treatment systems
- Power installations
- Telecommunications and other communications systems
- Transport systems
- Building automation

In general, indicators that cannot be evaluated due to the circumstances of the technical systems in the building are considered to have been complied with. Exceptions may be possible in individual cases and are indicated.

The factors that fundamentally denote the use and integration of the building technology in the building, the adaptability of technical systems and the integration of the building technology into the district are assessed.

Indicator 1: Passive systems

For new buildings, the site selected and the arrangement of the building structures form the basis for almost all passive measures for reducing the primary energy demand during building operation. They also create the conditions for using renewable energy sources such as solar thermal energy, photovoltaics and geothermal energy as well as for designing local heating systems.

The objective is to reduce the total energy demand of buildings via architectural, structural and services-based measures. First and foremost, measures concerning energy use are to be implemented in the building and building envelope to minimise transmission and ventilation heat losses. Such measures pertain to the arrangement and compactness of the building structure, the proportion of window area, use of daylight, solar radiation protection, the storage mass and the insulation standard.

Indicator 2: Adaptability of the distribution system to suit operating temperatures to enable the use of renewable energy

- Heat distribution and transfer system
- Cooling distribution and transfer system

The possibility of integrating renewable energy sources is evaluated positively. The building can be divided into different areas if required, to address issues regarding heat and cooling distribution. This enables such issues to be addressed separately in each area. If multiple different systems are installed in different areas, the results must be determined for each area in accordance with the energy demand. The overall result can be determined on an area-weighted basis. The calculation must be clearly shown.
The objective is to implement operating temperatures that can be achieved using renewable sources of heating/cooling. If the networks used here are separate, the output weighting (by energy demand) is the crucial factor for the evaluation.

The following example is intended to clarify the above situation:

System 1 cooling ceiling (VL 16 °C/RL 19 °C): 30 kWh/(m²*a) -> average operating temperature = 17.5 °C
System 2 recirculation cooler (VL 8 °C/RL 14 °C): 10 kWh/(m²*a) -> average operating temperature = 11.0 °C

Total output: 40 kWh/(m²*a)

Does the building use separate cold water networks?

If yes → evaluation weighted by output: 3/4 system 1 + 1/4 system 2
This results in the following evaluation: 4 points * 0.75 + 1 point * 0.25 = 3.25 points

If no → overall evaluation using system 2

If the building is not equipped with a cooling transfer system, 0 points are awarded. If documentation of retrofitting for a cooling system is available, this is evaluated in accordance with the temperature levels.

Cooling systems required for dehumidification are not taken into account.

Indicator 3: Accessibility of the building technology

The ease of accessibility of all components of the technical facilities for retrofitting and subsequent replacement is evaluated.

For replacement, the dimensions and weight of the largest and heaviest component in each case, including the means of transport, is used for the evaluation. The height and width of the passages and doors and, if applicable, the dimensions of the staircase or the dimensions and load-bearing capacity of the lift must be taken into account.

Details regarding the space requirements of technical equipment rooms can be specified in the VDI 2050 series of guidelines and/or DIN EN ISO 16484 Building automation and control systems (BACS) and/or EN 13321-1 Open data communication in building automation, controls and building management and/ or EN 13779 Performance requirements for ventilation and air-conditioning systems.

At least 80% of the net room area of all technical equipment rooms must be taken into account.

Indicator 4: Integrated systems

Indicator 4.1: Condition and expandability of system integration
Integration of existing systems into a building automation system is evaluated positively. Open and standardised protocols should be used in existing networks to ensure cross-system, interdisciplinary communication.

Indicator 4.2: Integrated functions in a higher-level system
This indicator evaluates specific, pre-existing functions integrated into a higher-level system is evaluated.

Indicator 4.3: Integration of the technical systems/media into the district/the immediate surroundings
This indicator evaluates whether an energy concept is in place that analyses integration into the district/surroundings. Points are awarded depending on the scope of the concept and the heat supply variants analysed. In addition, the actual implementation of elements of this concept is evaluated positively.

Indicator 4.4: Integration of the energy infrastructure into the district/the immediate surroundings
Circular economy bonus – district solution for renewable energy:
The consistent use of energy generated from renewable energy sources in the surrounding district/the immediate surroundings in the building to cover the building-related or user-related energy demand (at least 10% of the building-related final energy demand) is evaluated positively. As an alternative, transfer of energy generated in the building or on the premises using renewable energy sources to the district/the immediate surroundings (at least 10% more than the building-related final energy demand) is evaluated positively.

Circular economy bonus – grid-compatible energy system:
If the building provides a significant amount of storage capacity (approx. 10% in terms of the final energy demand of the building) for the purposes of grid compatibility or uses integrated energy and load management, this is evaluated positively.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements

Indicator 1. Passive systems

- Description of the energy concept with details indicating that it is primarily implemented via passive solutions.
- Verification check on the selected evaluation approach

Indicator 2. Adaptability of the distribution system to suit operating temperatures to enable the use of renewable energy

- Design of the heat and cooling transfer system (e.g. planned supply and return temperatures) via relevant excerpts from the planning documents
- Verification check of the selected evaluation approach

Indicator 3. Accessibility of the building technology

- Height and width of the passages and doors and, if applicable, dimensions of the staircase, e.g. via excerpts from the plans.
- Dimensions and load-bearing capacity of the lift, e.g. via excerpts from the data sheet.
- Photo documentation of the installation openings.
- Verifiable plans for reserves in the technical equipment rooms, e.g. via planning documents.
- Documentation of the accessibility of the vertical shafts/routes, e.g. via photo documentation.
- Documentation of the space reserved for the vertical shafts/routes, e.g. via planning documents or photo documentation.

Indicator 4. Integrated systems

- Commissioned system integration work, e.g. via excerpts from the contracts.
- Excerpts from the formulated overall concept for the building technology
- Verification check of the selected evaluation approach

APPENDIX C – LITERATURE

I. Version

Change log based on 2020 version

PAGE	EXPLANATION	DATE
514	General: scheme “Assembly buildings” has been added	16.09.2021
514	Shares of total score have been corrected	16.09.2021
517	Indicator 4.2: requirement list has been expanded	16.06.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org
- VDI guideline VDI 2050: Requirements for technical equipment rooms. Verein Deutscher Ingenieure e.V.
- DIN EN ISO 16484 Building automation and control systems (BACS)
- EN 13321-1 Open data communication in building automation, controls and building management
- EN 13779 Performance requirements for ventilation and air-conditioning systems.

TEC1.5

Ease of cleaning building components

Objective

Our objective is to implement structural and technical measures to reduce the cost and effort required for cleaning.

Benefits

The issue of how a building structure can be cleaned has a significant effect on the costs and environmental impact of a building during its use. Surfaces that can be easily cleaned require less cleaning agents and result in lower cleaning costs.

Contribution to overriding sustainability goals

No direct contribution to Sustainable Development Goals (SDGs) of United Nations (UN) or to German Sustainability Strategy.

Outlook

This criterion does not currently address the ease of maintenance of the building structure. If suitable evaluation methods are available, these will be addressed in the criterion.

Share of total score

	SHARE	WEIGHTING FACTOR
Office Education Residential Hotel Assembly buildings	1.3%	2
Consumer market Shopping centre Department stores Logistics Production	1.4%	2

EVALUATION

The type and scope of structural and technical measures implemented to improve the ease of cleaning of the building are evaluated using a total of seven indicators. The feasibility of and the reduction in the cost and effort required for cleaning of the façade are represented by indicators 1 and 2. Indicator 3 evaluates the ease of cleaning of floor coverings and enables alternative measures to be recognised via the innovation area. Increased ease of cleaning as a result of dirt traps, an unobstructed floor plan and durable, easily accessible surfaces is evaluated via indicators 4 to 6. The creation of a concept to ensure ease of cleaning is acknowledged via indicator 7. A maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**Accessibility of the exterior glass surfaces**	
1.1	**Feasibility of façade cleaning**	**Max. 15**
	■ Façade cleaning is possible using aids (exterior glass surface proportion in %; 1% ≙ 0.1 point).	(+) 0–10
	■ Cleaning is possible without aids (exterior glass surface proportion in %; 1% ≙ 0.15 point).	(+) 0–15
2	**Exterior and interior components**	
2.1	**Cost and effort required to clean exterior components**	**5**
	Measures have been implemented to reduce the cost and effort required for cleaning the exterior façade.	
2.2	**Cost and effort required to clean interior components**	**5**
	Measures have been implemented to reduce the cost and effort required for cleaning the interior components (e.g. glazed separating walls, parapets, railings). This also includes measures to make cleaning unnecessary.	
3	**Floor covering**	
3.1	**Ease of cleaning**	**Max. 20**
	Office **Education** **Consumer market** **Shopping centre** **Residential** **Hotel** **Logistics** **Production** **Assembly buildings**	
	■ Partially (only circulation areas are patterned, mottled or structured)	10
	■ Fully (patterned, mottled or structured).	15
	■ The selected floor covering verifiably results in reduced life cycle costs for cleaning.	+5
	Department stores	**Max. 20**
	■ At least 50% of the floor covering of sales areas is tolerant to slight contamination.	10
	■ At least 80% of the floor covering of sales areas is tolerant to slight contamination.	15
	■ The selected floor covering verifiably results in reduced life cycle costs for cleaning.	+5

3.2	**INNOVATION AREA** Improvements to the ease of cleaning of the floor covering via innovative solutions.	**As in 3.1**

4 **Dirt trap** at building entrances

4.1 **Dirt trap** at building entrances **I**

Office **Education** **Consumer market** **Shopping centre** **Department stores** **Hotel** **Logistics** **Assembly buildings** **Production** **Residential**

■ There are dirt traps at every main entrance.	**5**

4.2 **Dirt trap** at building entrances **II**

Office **Education** **Consumer market** **Shopping centre** **Department stores** **Hotel** **Logistics** **Production** **Assembly buildings**	**5–10**
■ All dirt traps comply with the three-step principle (approx. 2.4 m).	5
■ All dirt traps comply with the five-step principle (approx. 4 m).	10
Residential	**5–10**
■ All dirt traps comply with the two-step principle (approx. 1.6 m).	5
■ All dirt traps comply with the five-step principle (approx. 4 m).	10

5 **Unobstructed floor plan**

5.1 **Obstacle prevention**

Office **Education** **Consumer market** **Shopping centre** **Department stores** **Hotel** **Logistics** **Production** **Assembly buildings**	**Max. 20**
■ Radiators at a suitable height (ground clearance ≥ 15 cm).	2.5
■ No radiators.	5
■ Railing supports for staircases/balustrades, if any, are attached laterally (no support points on the steps/floor).	+5
■ WCs and sinks are attached to the walls.	+2.5
■ Separating walls for booths are designed without support points on the floor or as separating walls with a wall/floor connection wherever possible.	+2.5
■ Freestanding supports are positioned at a distance of at least 20 cm from the surrounding components (for this point, 10% of all supports can be ignored for the evaluation).	+5
■ Lighting is integrated into the ceiling and does not need to be cleaned.	+2.5
■ Closets are available and can be used in place of shelves and cabinets.	+2.5
Residential	**Max. 20**
■ Radiators at a suitable height (ground clearance ≥ 15 cm).	2.5
■ No radiators.	5
■ Railing supports for staircases/balustrades, if any, are attached laterally (no support points on the steps/floor).	+5
■ WCs and sinks are attached to the walls.	+5
■ Freestanding supports are positioned at a distance of at least 20 cm from the surrounding components (for this point, 10% of all supports can be ignored for the evaluation).	+5

6 Surfaces

6.1 Surfaces that are frequently used and difficult to access **10**

Measures have been implemented to make surfaces that are frequently used (work surfaces, handles, doorknobs, light switches, lift buttons, etc.) easier to clean and thereby to improve hygiene, and to make surfaces that are difficult to access (hanging lights, solar radiation protection, shelves, cabinets, ledges, corners) easier to clean.

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7 Concept to ensure ease of cleaning

7.1 Consideration in the planning process **5**

Potential and necessary measures for ensuring ease of cleaning are taken into account in the planning process.

7.2 Cleaning concept **5**

A detailed concept to ensure ease of cleaning is available.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The following aspects can be used for communication as key performance indicators (KPI):

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Proportion of exterior glass surfaces that can be cleaned without aids	[%]
KPI 2	Proportion of floor coverings (interior) with high tolerance to contamination	[%]

Synergies with DGNB system applications

- **DGNB INTERIORS:** The results of indicators 1 to 5 can to some extent be incorporated into the checklist for criterion PRO1.1, indicator 1 of the interiors scheme (version 2017). Indicator 7 corresponds to the content of criterion PRO8.1.

  DGNB RENOVATED BUILDINGS: Indicators 1 to 5 largely correspond to criterion PRO1.5, indicators 2 and 3 in the renovated buildings scheme (application NBV15).

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

The issue of how a building structure can be cleaned has a significant effect on the costs and environmental impact of a building during its use. Surfaces that can be easily cleaned require less cleaning agents and result in lower cleaning costs.

The objective must therefore be to keep operating expenses for cleaning as low as possible while ensuring a long material lifespan.

II. Additional explanation

Building structures that are cleaned according to schedule and that enable cleaning measures to be carried out easily are evaluated positively.

III. Method

Indicator 1: Accessibility of the exterior glass surfaces
This indicator evaluates how easily the exterior glass surfaces can be cleaned. The surfaces to be considered include windows and façade surfaces as well as PV systems. Exterior glass surfaces that can be cleaned without the use of aids are more highly evaluated due to the lower expected cleaning costs. This is generally the case for window casements that can be opened inwards, or where the distance from the top of the standing surface to the top of the glass surface is approximately 4 m.

Points can also be awarded for façade surfaces that can be cleaned using technical aids, such as a telescopic pole from the fixed base or through a façade inspection and maintenance conveyor a cleaning bridge. The use of cherry pickers or climbing harnesses is not permitted here.

The proportion percentage of the total area must be rounded up or down to the nearest whole percentage point in accordance with the rules for commercial rounding of figures.

Indicator 2: Exterior and interior components
This indicator evaluates whether measures are implemented on the exterior façade or on the interior components for reducing the cost and effort required for cleaning.

Solutions that use alternative structural and technical solutions for easier cleaning or that eliminate the need to carry out cleaning are evaluated positively. Measures can be applied here that, for example, reduce the use of cleaning agents, shorten the duration of the cleaning process or increase the intervals between cleaning processes.

Implementation of structural measures against dirt (e.g. functioning drip edges or eaves) or the creation of dirt-repellent surface properties (e.g. lotus effect) is evaluated positively.

Indicator 3: Floor covering
This indicator evaluates whether the floor covering is tolerant to slight contamination.

- Tolerant: Patterned, mottled or structured.
- Partially tolerant: Only circulation areas are patterned, mottled or structured.
- Not tolerant: Not patterned, mottled or structured.

If the floor covering cannot be clearly assigned to one of these categories, the worst evaluation must be selected in each case. The overall evaluation is carried out on an area-weighted basis, and all circulation areas and 80% of the usable area must be included. However, it is possible to address large sub-areas differently depending on the type and colour of the floor covering.

In addition, demonstrable positive effects on the life cycle costs as a result of appropriate selection of the floor covering (e.g. lower cleaning frequency due to the floor covering selected or the use of carpet tiles) are evaluated positively.

Indicator 4: Dirt trap at building entrances
This indicator evaluates whether a sufficiently long dirt trap is in place at the main entrances.

Dirt traps include grating or suitable plastic or natural fibre mats (if sufficiently protected against moisture when situated outside) in front of and directly behind the entrance door.

It must be ensured that adequate dirt traps are in place in front of and/or behind all main entrances. This concerns both the main and the secondary uses of the building. Staff access, delivery access and secondary access routes do not need to meet these specifications.

If no other option is available due to structural constraints, the dirt trap can then also be installed in the interior of the building (as a structural measure if possible).

If it is not possible to implement the required length of dirt trap as a structural measure, non-structural systems can also be recognised if their positioning and maintenance is included in the service agreement for the FM service provider.

Indicator 5: Unobstructed floor plan
This indicator evaluates whether the room layout and fittings have been implemented with the fewest possible obstructions.

Individual components are evaluated in terms of their ease of cleaning.

If there are no bannisters or freestanding supports, the points for this indicator can be awarded in full.

Indicator 6: Surfaces
The implementation of measures to make surfaces that are frequently used (work surfaces, handles, doorknobs, light switches, lift buttons, etc.) and surfaces that are difficult to access (hanging lights, sun protection, shelves, cabinets, ledges, corners) easier to clean is evaluated positively.

Indicator 7: Concept for ensuring ease of cleaning

Cleaning costs have a significant impact on the operation costs. Appropriate planning to increase the ease of cleaning enables these costs to be significantly reduced, the quality of the use and management of the building to be improved and the longevity of systems and constructions to be ensured.

Ease of cleaning has already been shaped and determined in the planning phase.

A detailed plan for ensuring ease of cleaning takes into account, among other things, the selection of suitable material, system and design solutions, the accessibility of components that require frequent cleaning and the availability of appropriate utility connections and storage rooms.

IV. Usage-specific description

Residential

Indicator 3: Floor covering

The area reference specified in the "Method" section is not used in this scheme. The floor coverings in communal areas (circulation areas such as entrance areas, corridors and stairways outside of the residential units) must be taken into account.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements

Indicator 1: Accessibility of the exterior glass surfaces

- Formulated cleaning concept.
- Representation of the accessibility of the window surfaces, e.g. via photo documentation.
- List of the exterior glass surfaces, broken down by cost and effort required for cleaning.
- Calculation of the resulting evaluation points awarded.
- Product data sheets indicating the type of surface protection.

Indicator 2: Exterior and interior components

- List of the exterior components and documentation of the solutions used to reduce the cost and effort required for cleaning.
- List of the interior components and documentation of the solutions used to reduce the cost and effort required for cleaning.

Indicator 3: Floor covering

- List and evaluation of the floor coverings installed with regard to their tolerance to contamination
- Specification/documentation of the lifetime of the floor covering

Indicator 4: Dirt trap at building entrances

- Representation of the dirt traps using floor plans with dimension specifications.

Indicator 5: Unobstructed floor plan

- Representation via floor plans/photo documentation/manufacturer documentation

Indicator 6: Surfaces

- Short written justification for the levels selected.
- Appropriate documentation, e.g. via excerpts from the floor plans and photo documentation.
- List of areas with classification of the floor covering and the surfaces.

Indicator 7: Concept for ensuring ease of cleaning

- Confirmation by the building owner regarding the submission of a concept to ensure ease of cleaning.

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
all	General and evaluation: scheme “assembly buildings” has been added	16.09.2021
525	Shares of total score have been corrected	16.09.2021

II. Literature

Fundamental sources chosen from the available lists of substances and material data:

- Nachhaltiges Bauen [Sustainable building] guide. German Federal Ministry of Transport, Building and Urban Development (BMVBS). April 2013
- Sustainable Development Goals icons, United Nations/globalgoals.org

TEC1.6

Ease of recovery and recycling

Objective

Our objective is to ensure highly economical and efficient use of natural resources. Accordingly, we promote solutions that enable pre-existing value to be made reusable with a minimum of loss. In accordance with our goal of reducing the amount of primary resources required for construction and maintenance of buildings to virtually nothing, we strive to create a strategy to increase the current level of material efficiency – the purpose of which is to enable materials to be recycled with effectively no losses, in conjunction with a significant reduction in the materials used. To this end, the "Ease of recovery and recycling" criterion aims to address one of the most important issues for the DGNB: Creating a "Circular economy" that enables participants and users to reduce consumption of natural resources to a minimum and ideally to completely avoid consumption of natural resources, in order to ensure that once we have used resources for our own purposes, they will continue to be available to future generations to the highest extent possible – enabling those generations to develop in a way that ensures their well-being.

Benefits

Building owners who implement reductions in the use of materials in their buildings can benefit from reduced costs even during the construction phase. In turn, users enjoy positive effects in the operating phase – with in some cases significantly lower costs and effort required for modernisation work as well as for maintenance, repair and above all conversion measures. The long-term objective of this criterion – which requires in-depth knowledge regarding the materials used in buildings – enables buildings to be considered as means of "storing" raw materials, and for building owners to plan buildings as a lucrative store of future value for themselves.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	8.4	Global resource efficiency and decoupling economic growth	8.1	Resource conservation
	12.2	Use of natural resources		
	12.5	Reducing and eliminating waste		
Moderate	12.4	Environmentally friendly handling of chemicals and waste		

Outlook

The recycling paths of material groups are continuously changing, for instance due to process and equipment costs, achievable prices and the recycling path margins. Recycling logistics and recycling plants for a large range of material flows are still in testing or development – while new technologies are being continuously further developed. The associated evaluation tool with example assignments of (construction) materials to the recycling paths that are currently applied as standard is therefore subject to constant adjustments. In addition, as standards or reliable parameters for avoiding use of materials in conventional building components are applied with increasing frequency, it can be assumed that quality levels will increase ever further in future.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	2.5%	4
Consumer market **Shopping centre** **Department stores**	2.9%	4
Logistics **Production**	2.7%	4
Assembly buildings	2.6%	4

EVALUATION

Solutions that use the current recycling paths of construction materials as a benchmark can be used to select construction materials that are easy to recycle (indicator 1). These recycling paths are assigned to "quality levels" (QL). Points for the use of reused and reusable building components and the avoidance of building components are awarded separately via two specific circular economy bonuses. If the building structure is intended to be easy to recover, this can be described via the ease of disassembly and ease of separation of the building components in terms of material types contained as far as possible (indicator 2). The evaluation of the construction materials and design solutions used with regard to these two indicators should be applied to the majority of the Standard Building Components (SBC) used on a regular basis. In addition, an incentive is established for using evaluation methods that focus on recycling and recovery as part of the planning process for the building (indicator 3). In this criterion, a maximum of 100 points can be achieved in total without bonuses, or a maximum of 130 points including bonuses.

NO.	INDICATOR	POINTS	POINTS	POINTS
1	**Ease of recycling**			**Max. 20**
1.1	**Selection of easy-to-recycle construction materials** **Building components (relevant reference values)**	60% of the SBC at least in QL1	Upgrading to QL1: Per SBC, >10% in QL2 in addition[1]	60% of the SBC at least in QL2
	External walls (m²)			
	Non-load-bearing or prefabricated (External walls, parapets, infillings; Prefabricated façade units, consisting of external walls, windows, doors, claddings)	**+0.5**	+0.5	**+2**
	Cladding units of external walls (External claddings of external walls and columns), including plaster coats, damp-proofing, insulating and protective layers	**+0.5**	+0.5	**+1**
	Internal linings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers	**+0.5**	+0.5	**+1**
	External doors and windows (Windows and display windows, doors and gates, including sills, frames, fittings, actuating systems, ventilation components and other built-in elements)	**+0.5**	+0.5	**+1**
	Internal walls (m²)			
	Non-load-bearing or prefabricated (Internal walls, infills; sectional walls, consisting of internal walls, doors, windows, claddings, e.g. folding and sliding walls, sanitary partitions, crates)	**+0.5**	+1.5	**+4**
	Internal linings (of internal walls) (Claddings including plaster, sealing, insulating, protective layers on interior walls and columns)	**+0.5**	+1.5	**+4**

[1] Applicable up to the maximum number of evaluation points, as in the column "60% of the SBC at least in QL2"

NO.	INDICATOR	POINTS	POINTS	POINTS
	Internal doors and windows (Doors and gates, windows and shop windows including frames, fittings, drives and other built-in elements))	**+0.5**	+1	**+3**
	Floors and ceilings (m²)			
	Floorings (Coverings on floors, including screeds, damp-proof courses, insulating and protective layers, wearing surfaces; false floors for services and floating floors)	**+1**	+2	**+6**
	Ceiling linings (Linings of ceilings, including plastering, damp-proof courses, insulating and protective layers; false ceilings for lighting and other services)	**+1**	+1	**+5**
	Roofs (m²)			
	Roof coverings (Coverings on roof structures including formwork, battens, slope, sealing, insulating, protective and wearing courses; drainage of the roof surface until connection to the drainage systems)	**+0.5**	+0.5	**+1**
	Roof linings (Roofing under roof structures including plaster, sealing, insulating, protective coatings; light and combination ceilings under roofs)	**+0.5**	+0.5	**+1**
	Load-bearing structures (m²)			
	Load-bearing external walls (Load-bearing external walls, including horizontal damp-proofing)	**+0.5**	+1.5	**+4**
	External columns (Columns and pillars with a cross-sectional ratio <1: 5)	**+0.5**	+0.5	**+1**
	Load-bearing internal walls (Load-bearing internal walls including horizontal seals)	**+0.5**	+1	**+3**
	Internal columns (Columns and pillars with a cross-sectional ratio <1: 5)	**+0.5**	+0.5	**+1**
	Floor structures (Floors, stairs, ramps, balconies, loggias, including suspender beams and joists, and infill elements such as hollow blocks, false floors, fills, but not including coverings and linings)	**+0.5**	+1.5	**+4**
	Roof structures (Constructions of roofs, trusses, space structures and Domes including over and undercarriages, filling parts such as hollow bodies, blind floors, fillings, but without coverings and claddings)	**+0.5**	+1	**+2**
	Foundations (m²)			
	Shallow or deep foundations (Single-, strip foundations, foundation plates; pile foundations including grates, well foundations;	**+0.5**	+0.5	**+1**

	anchorages))			
	Subsoil and base slabs and sealing of buildings (Subfloors and floor slabs, which do not serve the foundation; seals of the building including filter, separation and protective coatings)	**+0.5**	+0.5	**+1**
	Floorings (Coverings on floor and foundation slabs, e.g. screeds, sealing, Insulation protection, wear layers)	**+0.5**	+0.5	**+1**

NO.	INDICATOR		POINTS
Re 1.1	**INNOVATION AREA** Explanation: measures that are outside of the scope of analysis as defined above (building components, see above) or do not currently fall within the definition of the quality levels, but nevertheless contribute significantly to achievement of the objective, can be taken into account in indicator 1.1 in accordance with the evaluation logic applied above (adequate mass and replacement relevance over the reference period).		**As in 1.1**
1.2	**CIRCULAR ECONOMY BONUS – REUSE OR MATERIAL RECOVERY** Explanation: the circular economy bonus – reuse or material recovery is achieved for each Standard Building Component (SBC) > 10% if building components are reused or there is documentation of material recovery to create a comparable product (recycling path no. 2 and no. 3 in accordance with Table 1). Points can be awarded in addition to QL2		**+20 (+1 per SBC)**
1.3	**CIRCULAR ECONOMY BONUS – AVOIDING USE OF** building **COMPONENTS** Explanation: The circular economy bonus – avoiding use of building components is achieved for each Standard Building Component (SBC) > 10% if the solution plausibly and demonstrably avoids the use of raw materials or secondary materials to a significant degree. Points can be awarded in addition to QL2. Alternatively, the points can be awarded in indicator 1.1 for each structural element not used.		**+10 (+1 per SBC)**

NO.	INDICATOR	POINTS	POINTS
2	**Ease of recovery**		**Max. 70**
2.1	**Easy-to-recover building structure** **Building components (relevant reference values)** **External walls (m²)**	60% of the SBC at least in QL1	60% of the SBC at least in QL2
	Non-load-bearing or prefabricated (External walls, parapets, infillings; Prefabricated façade units, consisting of external walls, windows, doors, claddings)	**+0.9**	**+5**
	Cladding units of external walls (External claddings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers);	**+0.9**	**+3.3**
	Internal linings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers	**+0.9**	**+3.3**
	External doors and windows	**+1.7**	**+3.3**

(Windows and display windows, doors and gates, including sills, frames, fittings, actuating systems, ventilation components and other built-in elements)		
Internal walls (m²)		
Non-load-bearing or prefabricated	**+2.5**	**+10**
(Internal walls, infillings; sectional walls, consist of internal walls, doors, windows, claddings, e.g. folding and sliding walls, sanitary partitions, crates)		
Internal linings (of internal walls)	**+1.7**	**+10**
(Claddings including plaster, sealing, insulating, protective layers on interior walls and columns)		
Internal doors and windows	**+2.5**	**+10**
(Doors and gates, windows and shop windows including frames, fittings, drives and other built-in elements)		
Floors and ceilings (m²)		
Floorings	**+3.3**	**+15**
(Coverings on floors, including screeds, damp-proof courses, insulating and protective layers, wearing surfaces; false floors for services and floating floors)		
Ceiling linings	**+3.3**	**+15**
(Linings of ceilings, including plastering, damp-proof courses, insulating and protective layers; false ceilings for lighting and other services)		
Roofs (m²)		
Roof coverings	**+0.9**	**+3.3**
(Coverings on roof structures including formwork, battens, slope, sealing, insulating, protective and wearing courses; drainage of the roof surface until connection to the drainage systems);		
Roof linings	**+0.9**	**+3.3**
(Roofing under roof structures including plaster, sealing, insulating, protective coatings; light and combination ceilings under roofs)		

Re 2.1 **INNOVATION AREA** — **As in 2.1**

Explanation: measures that are outside of the defined scope of analysis (building components, see above) or do not currently fall within the definition of the quality levels, but nevertheless contribute significantly to achievement of the objective, can be taken into account in indicator 2.1 in accordance with the evaluation logic applied above (adequate mass and replacement relevance over the reference period).

NO.	INDICATOR	POINTS
3	**Ease of recovery, conversion and recycling in the planning process**	
3.1	**Recovery, conversion and ease of recycling in the early planning phases**	**Max. 10**
	Evaluation methods for the ease of recovery and recycling are used in early service phases (1–3) to optimise the resource efficiency (including for possible conversion work).	**+5**
3.2	**Recovery, conversion and ease of recycling in the detailed design process**	
	Evaluation methods for the ease of recovery and recycling are used in the approval or	**+5**

detailed design service phases (4–5) to optimise the resource efficiency (including for possible conversion work).

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Based on the evaluation, the share of building components with materials selected for ease of recycling, the share of building components that are easy to recover and the intended recycling and recovery quota for the entire building structure can be used as key performance indicators (KPI) for communication. Application of the criteria and calculation basis can be used in part for reporting in accordance with the "Level(s) – Common EU framework of core environmental indicators" (information regarding the EU framework is available under the [T&D_02] chapter).

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Share of building components with materials selected for ease of recycling = sum of the shares of building components as a proportion of the corresponding reference value share in QL 2 or circular economy bonus – reuse or material recovery.	[% reference quantity share]
KPI 2	Share of building components that are easy to recover = sum of the shares of building components as a proportion of the corresponding reference value share in QL 2.	[% reference quantity share]
KPI 3	Intended recycling and recovery quota for the entire building structure = in accordance with the German Recycling Law (KrWG) (Section 14, 3), the percent by weight of the entire building structure that can be allocated to recycling paths 2, 3, 4, 5 and 7.	[% weight share]
KPI 4	Level(s) Indicator 2.2 "Life cycle scenarios" – Use of the DGNB criterion TEC1.6 in the planning process	[-]

Synergies with DGNB system applications

- **DGNB RENOVATED BUILDINGS:** Indicators 1 and 2 correspond in large part to the indicators in criterion TEC1.6 from the scheme for renovated office and administrative buildings (version 2016).
- **DGNB INTERIORS:** Indicators 1 and 2 correspond in large part to the indicators in criterion TEC1.6 from the scheme for interiors.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

The core elements of the approach are clearly defining and assigning product responsibilities, for example for materials, construction products and systems used, etc., as well as demonstrating planning solutions that positively affect the ease of recovery and recycling of the building. High ease of recycling is a tangible sustainability quality, as it positively affects multiple important dimensions of sustainability (life cycle assessments, environmental impacts, operating costs, etc.). In accordance with the UN sustainable development goal 12 “Ensure sustainable consumption and production patterns”: by 2030, sustainable management and efficient use of natural resources alongside with the substantial reduce of waste generation through prevention, reduction, recycling and reuse have to be achieved by 2030 and already by 2020, environmentally sound management of chemicals and all wastes throughout their life cycle have to be implemented. The objective of this criterion should be considered in terms of this context.

II. Additional explanation

Due to the high average expected lifetime of buildings and its components, many of the materials used in construction today will only become demolition material or potential waste 50 or 100 years in the future. The construction sector therefore constitutes a form of large-scale, anthropogenic temporary storage. It is therefore an important resource for future construction materials and should not be used as a temporary disposal site for future waste products.
The objective of increasing the ease of recovery and recycling is to conserve natural resources and reduce waste, specifically by reducing the quantity and harmfulness of waste. This criterion fundamentally considers the building or its relevant **component** elements in terms of design and materials. The materials level focusses the potential for resource efficiency. It is important here to pursue the objective of reducing the use of primary raw materials in the construction planning phase itself, and to prefer recyclable materials when selecting construction materials. It is important to ensure that recycled material can be extracted at a high level of quality and sorted into its containing material types as far as possible during demolition of a building. As part of a constructive approach, it is important to demonstrate that building components can be removed, and no distinction is made between doing so at the construction site or in the factory. In addition, the connections for building components on the support structure must be designed to enable the building components to be easily removed.
The end-of-life phase and obvious conversion phases must be taken into account in the planning of buildings.

When doing so, the following <u>four aspects</u> must be considered:

- **1. Materials level:** selection of easy-to-recycle construction materials.
  The objective is to enable recovery of demonstrably recyclable materials at the end-of-life of the construction materials used. In some circumstances, additives and coatings may adversely affect the recyclability.

- **2. Design level:** easy-to-recover building structure.
  The objective here is to plan the dismantling of building components and construction products. Easy dismantling of construction products or entire building components enables better reuse or continued use of building components
  – or the recycling of materials via recovery at the construction site or in the factory. Furthermore, an easy-to-recover building structure increases the ease of repair during the life stage of the building.

- **3. Planning responsibility**
  Designers should take issues regarding dismantling and recycling into account and actively discuss these with their building owners early in the selection process for construction materials and construction products. This provides a huge benefit for the building in the operating phase. If the selection process for the solutions is not carried out with these issues in mind, the building owner should be proactively informed of this by the planning team.
  A corresponding list of the "not easy-to-recycle" structural elements should be provided to the building owner, supplemented by a list of the structural elements installed that are easy to recycle, if applicable.

- **4. Product responsibility**
  The manufacturers or companies contracted to provide services should supply adequate confirmation that their products, building components or services meet the requirements of the quality levels in the indicators defined below. For the "reuse" recycling path, take-back obligations or documentation of business models that provide for temporary transfer of products for fulfilling functions in the building (e.g. leasing of products "as a service") should be provided by manufacturers.

III. Method

This criterion is divided into three indicators:

Indicator 1: Selection of easy-to-recycle construction materials
Indicator 2: Easy-to-recover building structure
Indicator 3: Ease of recovery, conversion and recycling in the planning process

In order to narrow the scope of verification, the evaluation should only be carried out for the relevant "Standard Building Components" (SBC).

- **Standard Building Components** (SBC) are, for the purposes of this criterion, building components with essentially identical structure or construction.
- **Scope of coverage** for Standard Building Components: for evaluation of a building component group, at least 60% of the relevant reference value for the building component group in question must be covered (see above detailed list under the chapter - Evaluation, where structural building components evaluated on main and the sub levels).
- **Relevance of a Standard Building Component for upgrading from QL1 to QL2** (only applicable to indicator 1): Standard Building Components that are evaluated in accordance with a higher quality level than the rest of the building component group can upgrade the evaluation of the building component group via awarding of extra points, up to the maximum possible number of evaluation points for quality level 2. The evaluation should only be upgraded if the Standard Building Components constitute at least a 10% share of the reference value of the corresponding building component group. Moderate downward deviations from this 10% rule are possible if it is confirmed that particularly innovative solutions or solutions that are particularly effective for fulfilling the intent of this criterion are implemented.

For evaluation purposes, the building component groups are divided into three general groups that – in accordance with their typical frequency of replacement and area relevance – are awarded points weighted accordingly:

- Primary construction/structure, frequency of replacement assessed once (assumed typical frequency of replacement = 0 x per 50 years)
- Enveloping surfaces, frequency of replacement assessed twice (assumed typical frequency of replacement = 1 x per 50 years)
- Fittings, frequency of replacement assessed five times (assumed typical frequency of replacement = 4 x per 50 years)

This assessment includes only the structural building components without building technical components (detailed list of structural components shown at the beginning of this document under the Evaluation chapter). An "essentially identical structure" exists where the materials and elements used and the composition of the building component are identical. The number, volume or mass of the material or element in question found within the building component can vary (examples: External wall structures with different insulation thicknesses but identical structure, or interior doors with identical construction but different opening dimensions, can each be evaluated collectively). All materials and elements in the structure of a Standard Building Component must always be taken into account, regardless of their number, volume or mass, i.e. paints, coatings and adhesives are also relevant. Connecting elements for other building components that are not part of the structure of the Standard Building Component (e.g. skirting boards) do not need to be taken into account. The "relevant reference value" is the assessment parameter normally used for the building components on the sub level (Appendix 1, of the criterion ECO1.1 is also provides a comprehensive list of the structural building components on the main and sub levels) for example: Base slabs, external walls, internal walls, ceilings and roofs in m^2; supports, windows, internal doors in units, etc.. If relevant building component groups are not found in the building, the points are awarded with no documentation of content for QL2 – or can be awarded in accordance with the circular economy bonus – avoiding use of building components.

For guidance and facilitate purposes and also for the evaluation of this criterion, DGNB provides a "TEC1.6 calculation tool". This tool shows examples – for selected building component groups and will facilitate the calculation process to support DGNB Auditors and Consultants.

Indicator 1: Ease of recycling of selected construction materials

The intended objective is for construction materials for building components to be selected with recycling in mind. Building component groups are defined as building components on the sub level of the structural building components in accordance with the list provided under the Evaluation chapter above, or Appendix 1 of the criterion ECO1.1. The relevant building component groups that can be evaluated separately (if available) and must be taken into account for this indicator are:

External walls

- Non-load-bearing or prefabricated external walls
- Cladding units and internal linings of load-bearing and non-load-bearing external walls or prefabricated external walls
  External doors and windows

Internal walls:

- Non-load-bearing or prefabricated internal walls
- Internal linings of load-bearing and non-load-bearing internal walls
  Internal doors and windows

Floors and ceilings:

- Floorings
- Ceiling linings

Roofs:

- Roof coverings and roof linings

Load-bearing structures:

- Load-bearing external walls
- External columns
- Load-bearing internal walls
- Internal columns
- Floor structures
- Roof structures

Foundations:

- Shallow foundations or deep foundations
- Subsoil and base slabs and sealing of buildings
- Floorings for subsoil and base slabs

Evaluation of indicator 1

An evaluation of the specified building component groups on the sub level of the structural building components (without building technical components) can be carried out, if an identical quality level should be assigned to the Standard Building Components. Load-bearing building component groups must be evaluated in accordance with the structural element group, "Structure" or "Foundations", they are assigned to.

If 60% of the Standard Building Components within a building component group meet the requirements, the building component group can be assigned a quality level in accordance with the table below. The construction material with the lowest recycling potential must always be used for the evaluation of each Standard Building Component.

Insignificant proportions of elements not included in the building component group such as **connections or connectors** do not need to be evaluated here, unless they significantly reduce the recyclability of the building component under evaluation in accordance with its categorisation into "quality level 2" or "circular economy bonus – reuse or material recovery" or the materials ingredients used in the elements present a justified potential risk for subsequent recovery. The connector should be taken into account in the evaluation of the building component whose recyclability is more heavily reduced by the use of the connector. If the reduction in recyclability is equal across the two building components, the connector should be taken into account in the evaluation of both building components. The use of any harmful or hazardous substances can result in severe reductions in recyclability, even if they are found in the insignificant proportions of elements not included in the building component group. For this reason, the following connections or connectors can only be excluded from the evaluation if it is documented that their implementation meets the requirements for "quality level 3" or the highest content requirements in accordance with the DGNB criterion ENV1.2 "Local environmental impact" (the line numbers correspond to the ENV1.2 criteria matrix):

- Wet-coated steel building components (line 15): use of fire protection coatings free of halogens
- Interior load-bearing wood constructions together with outward overhangs (line 28): with no chemical wood preservative
- Profiles and coverings made of aluminium and stainless steel (lines 32 and 33): without using chromium trioxide (chromium(VI)) for passivation and no lead, cadmium or chromium trioxide compounds used in the cover coating (manufacturer declaration: Lead, cadmium and chromium trioxide content < 0.1% each)
- Plastics used for surface coverings (floor and wall) as well as building components on the building envelope (resilient floor coverings made from vinyl/PVC/rubber, wall coverings such as vinyl wallpaper/laminates, skylights, plastic windows, sound insulation linings, line 35): not containing organolead, organocadmium or organostannic compounds (manufacturer declaration: content < 0.1%)
- Plastic films on roof and foundations (line 36): not containing organolead, organocadmium or

organostannic compounds (manufacturer declaration: content < 0.1%)

- Construction products equipped with flame retardants (building services insulating materials made of EPDM/rubber/PE and wall coverings such as fibreglass wallpapers, non-woven paint substrates, non-woven decorative fabrics, etc., line 43): no chlorinated paraffins, no polybrominated biphenyls, no polybrominated biphenyl ethers and no TCEP (manufacturer declaration: content < 0.1%)
- Plastic products (plastic films for sealing external walls and roofs, wall coverings such as vinyl wallpapers/laminates, plastic windows, electrical cables, line 44): no SVHCs (manufacturer declaration: content < 0.1%)
- Construction products (products) equipped with biocides and flame retardants: chemical wood preservative on load-bearing wood constructions, wood fibre insulation boards, organic insulating materials (line 45): no boron compounds (manufacturer declaration: content < 0.1%)

It should be noted that **coatings, adhesions or additives** can also reduce or impede recyclability in accordance with "quality level 2" or the "circular economy bonus – reuse or material recovery" or present a justified potential risk for subsequent recovery. For this reason, a declaration from the manufacturer or a disposal company is always required, stating that the coatings, adhesions or additives used will not result in any reduction in the recyclability of the building component/ building sub-component/product and do not contain the harmful or hazardous substances listed below. For this reason, for the product groups specified under "connections/connectors" and, in addition, the product groups listed below, if they are included in the building component/product under evaluation as coatings, adhesions or additives, it must be documented that their implementation meets the requirements for "quality level 3" as a minimum or the highest content requirements in accordance with DGNB criterion ENV1.2 "Local environmental impact" (the line numbers correspond to the ENV1.2 criteria matrix):

- Additives in textiles and resilient floor coverings (line 6): biocidal products in accordance with 528/2012/EC, (line 7): SVHC and no chlorinated paraffins and phthalates that are toxic to reproduction (manufacturer declaration: Content < 0.1%)
- Wooden windows and internal and external non-load-bearing wood building components (e.g. façade and patio, line 30): No chemical wood preservative or only with marketable biocidal products in accordance with 528/2012/EC

In cases where further (e.g. technical) development of the normal recycling path counteracts the reduction in recyclability specified above and a manufacturer can demonstrate this to the DGNB accordingly for its products, this requirement does not apply for that specific case.

Definitions and quality levels for indicator 1

- Structural element group: the sum of all elements that can be summarised in a building component group on the main level
  (e.g. all external walls)
- Structural element: An assembled element that can be specified in a building component group on the main level
  (e.g. an external wall type)
- Building component group: the sum of all elements that can be summarised in a building component group on the sub level
  (e.g. all cladding units)
- Building component: an assembled (where applicable) element that can be specified in a building component group on the sub level
  (e.g. a cladding unit type)

- Building sub-component: a sub-element of a building component
  (Construction) product: any product that is permanently installed into the building or parts thereof

TABLE 1: RECYCLING AND DISPOSAL PATHS

NO.	RECYCLING AND DISPOSAL PATHS	DESCRIPTION	QUALITY LEVEL
1	**Avoidance**	Parts that are normally used as standard in a structural element are not used, or significantly fewer structural elements are used for an entire building component group than is normally considered to be standard for the specific use. Example: no ceiling covering, no upper surface covering.	**CE bonus – avoiding use of building components**
2	**Reuse**	The building component/building sub-component/construction product remains unchanged in the building (for the Renovated buildings scheme) or is (after minimal retrofitting) already reused. Alternatively: a take-back guarantee or leasing system exists for the building component/building sub-component/construction product.	**CE bonus – reuse or material recovery**
3	**Material recovery to create a comparable product**	With currently available technology, the material in the building component/ building sub-component/construction product can predominantly be reused, providing an equivalent building component/ building sub-component/construction product. Alternatively: a take-back guarantee or leasing system exists for the building component/ building sub-component/construction product.	**CE bonus – reuse or material recovery**
4	**Material recovery in building construction**	With currently available technology, the material of the building component/ building sub-component/construction product can predominantly be recovered, enabling it to be used for production of a new building component/ building sub-component/construction product for building construction.	**QL 2**
5	**Material recovery**	With currently available technology, the building component/ building sub-component/construction product can predominantly be used as a secondary raw material for use outside of building construction.	**QL 2**
6	**Energy recovery**	With currently available technology, the building component/ building sub-component/construction product is predominantly used as a substitute fuel in a production building (e.g. a cement plant or an in-house cogeneration plant) or in a waste incineration plant, enabling recovery of its energy.	**QL 1**
7	**Backfilling**	With currently available technology, the building component/ building sub-component/construction product is predominantly used as a substitute for other	**QL 1**

		backfill materials for backfilling (residual) cavities.	
8	**Disposal in landfill**	With currently available technology, the building component/ building sub-component/construction product is predominantly disposed of in landfills (landfill class 1, in accordance with ENV2.3 soil contamination classes).	**QL 0**
9	**Disposal as "hazardous waste"**	With currently available technology, the building component/ building sub-component/construction product is predominantly disposed of in class 2–3 landfills or in separate disposal facilities (in accordance with ENV2.3 soil contamination classes).	**QL 0**

For quality level 1 (recycling path 6 and 7) and quality level 0 (disposal path 8 and 9), the building owner must always be presented with a list of all Standard Building Components in the building allocated to these recovery and/or disposal paths. Confirmation by the building owner/client that they have received and understood this list is required.

Circular economy bonus – reuse or material recovery
If the recycling paths "reuse" or "material recovery to create a comparable product" are documented for Standard Building Components, a circular economy bonus – reuse or material recovery can be awarded for the building components in question. A maximum of 20 points can be awarded for the building for circular economy bonuses – reuse or material recovery. Every building component must meet the requirements for definition as a "Standard Building Component" in order for the bonus to be awarded.

Circular economy bonus – avoiding use of building components
If the recycling path "avoidance" is documented for Standard Building Components, specifying a plausible and clear reference scenario (standard), a circular economy bonus – avoiding use of building components can be awarded for the building components in question. A maximum of 10 points can be awarded for the building for circular economy bonus – avoiding use of building components. Every building component must meet the requirements for definition as a "Standard Building Component" in order for the bonus to be awarded.

Indicator 2: Easy-to-recover building structure
Ease of dismantling of building components is a fundamental requirement for subsequent ease of recycling. The intended objective is therefore to create a structure that can be easily dismantled. In order for the evaluation to be upgraded to a level higher than "standard", it must be documented that the Standard Building Components can be removed from the building using non-destructive methods and their layers can be separated into specific and distinct types.

The relevant building component groups that are to be taken into account for this indicator are[2]:

External walls:

- Non-load-bearing or prefabricated external walls
- Cladding units and internal linings of load-bearing and non-load-bearing external walls or prefabricated external walls
- External doors and windows

Internal walls:

[2] Detailed list of building components on the sub level available under the chapter “Evaluation” in this document

- Non-load-bearing or prefabricated internal walls
- Internal linings of load-bearing and non-load-bearing internal walls
- Internal doors and windows

Floors and ceilings:

- Floorings
- Ceiling linings

Roofs:

- Roof lights, roof openings
- Roof coverings and roof linings

A joint evaluation of the specified building component groups that comprise more than one building component group (sub level) should be carried out if an identical quality level should be assigned to them (example: Joint evaluation of non-load-bearing external walls and their internal linings and cladding units).

Evaluation

If 60% of the Standard Building Components within a building component group meet the requirements for quality level 2, the quality level of the building component group can be upgraded in comparison to a building structure that is not explicitly easy to recover (quality level 1). The lowest quality level must be used for the evaluation of a Standard Building Component. Insignificant proportions of elements not included in the building component group (such as connections or connectors) do not need to be evaluated here.

Definitions and evaluation levels for indicator 2

- For the purposes of this criterion, quality level 2 "easy-to-recover building structure" has been achieved if it is possible to remove the building components using non-destructive methods and the component layers can be separated into specific and distinct types or separation of the layers is not required because the individual layers/elements belong to the same (raw) material group.
- Quality level 1: Building structure that is not explicitly implemented with consideration to ensuring an easy-to-recover building structure as described above (quality level 2 – "easy-to-recover building structure"), but the building owner is aware of the possibility of recovery.
- For the purposes of this indicator, removal of building components using non-destructive methods means that it is possible to make the building component available for loss-free reuse or continued use (preparation for recycling path 2 in indicator 1). For this purpose, it must be possible to release the connections between the component and the building or adjacent building components without destroying remaining building components or building component layers.
- For the purposes of this indicator, ease of separation of building component layers into specific and separate types means that recovery of the materials is possible without limitation.

For quality level 1, the building owner/client must always be presented with a list of all relevant Standard Building Components in the building that are covered by this evaluation of ease of recovery, resulting in reduced ease of conversion/flexibility. Confirmation by the building owner/client that they have received and understood this list is required.

Indicator 3: Ease of recovery, conversion and recycling in the planning process

The intended objective is for the planning team to tackle the issue of ease of recovery and recycling of the building structure early in the planning process. To this end, evaluation methods for the ease of recovery and recycling should be used in early planning phases and in the detailed design process to optimise the resource efficiency (including for possible conversion work).

The type of evaluation method is not specified. However, the content of the method used should support the intended objective of the criterion. The use of adequate evaluation methods in the (preliminary) draft planning phase and/or in the detailed design process must be documented for a relevant scope but not necessarily the complete scope of the building structure (e.g. definable via mass share or share of Standard Building Components, etc.).
The key criterion for assessment of this indicator is not the scope so much as documentation of the time building component.

APPENDIX B – DOCUMENTATION

I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must clearly demonstrate compliance with the requirements for the target evaluation for the individual indicators.

Indicator 1: Selection of easy-to-recycle construction materials

- As an overarching requirement, a list must be presented classifying all relevant building component groups and specifying building component layers, taking into account the definition of Standard Building Components. The "TEC1.6 calculation tool" should be used for this. The building component groups should be listed in the same way as the building components for the life cycle assessment (same as for criterion ENV1.1), including the building component layers. Accepted forms of documentation for the classification of the quality levels are appropriate declarations by the manufacturers, designers or companies contracted to provide services. In general, one declaration per Standard Building Component is sufficient.

Documentation for quality levels 0 and 1:

- Declaration by the/a manufacturer or a disposal company, or plausible statement by the auditor specifying a reliable external source indicating that material recovery is normal for the building component/building sub-component/product and can be carried out with currently available technology.

Documentation for quality level 2:

- Declaration by the/a manufacturer or a disposal company, or plausible statement by the auditor specifying a reliable external source (e.g. EPD) indicating that material recovery is normal for the building component/building sub-component/product and can be carried out with currently available technology.
- Alternatively: Certificates/labels from recognised organisations responsible for issuing standards that confirm the content requirements of the indicator (see "DGNB label recognition" on the DGNB website)

Documentation for the circular economy bonus – reuse or material recovery:

- For "recovery to create a comparable product", documentation is not required if an adequate recycling path is usually available in the industry. Alternatively, if it is confirmed that a take-back guarantee for building components/building sub-components/products – for the purposes of reuse or recovery to create a comparable product – is provided by the manufacturer, manufacturer documentation to that effect must be presented. For "product leasing", manufacturer documentation must likewise be presented, confirming the planned recovery or reuse of the product. Alternatively, a declaration by a "component exchange" can be presented, which confirms that the construction product will retain a high resale value in future, and that the component exchange in question would accept resale of the product at the present time.

Documentation for circular economy bonus – avoiding use of building components:

- A plausible demonstration of a standard implementation of the building component for the use (building type) must be presented. A statement by the auditor based on this demonstration is required, explaining the rationale for avoiding/not using building components.

Additional documentation for quality level 2 or circular economy bonus – reuse or material recovery for building components/building sub-components/construction products with connections, coatings, adhesions or additives:

- Proportions of elements not included in the building component group (such as connections or connectors) do not need to be described or evaluated if it is confirmed that they do not significantly reduce the ease of recycling of the building component. Compliance with the highest content requirement in accordance with DGNB criterion ENV1.2 for the product groups specified in the method can be used to provide guidance here.
- Any coatings, adhesions or additives used always require a declaration from the manufacturer or a disposal company to the effect that they do not reduce the ease of recycling of the building component/building sub-component/product via the normal recycling path, or are not included in the building component. Compliance with the highest content requirement in accordance with DGNB criterion ENV1.2 for the product groups specified in the method can be used to provide guidance here.

Examples for indicator 1 "Selection of easy-to-recycle construction materials" for quality levels 0, 1 and 2 as well as for circular economy bonuses 1 and 2 can be found in the "TEC1.6 calculation tool".

Indicator 2: Easy-to-recover building structure

- As an overarching requirement, a list must be presented classifying all relevant building component groups and specifying component layers, taking into account the definition of Standard Building Components. The "TEC1.6 calculation tool" should be used for this. The building component groups should be listed in the same way as the building components for the life cycle assessment (same as for criterion ENV1.1), including the component layers.

Documentation for quality level 1:

- No manufacturer-specific, component-specific or product-specific documentation of ease of recovery is required. However, the building owner/client must present confirmation that they have received and understood a list of all Standard Building Components in the building that are covered by this evaluation of ease of recovery, resulting in reduced ease of conversion/flexibility, and are assigned to the quality level.

Documentation for quality level 2:

- Accepted forms of documentation that the building components can be removed using non-destructive methods are appropriate declarations by the architect/structural planner, product manufacturer or company responsible for providing services. In general, one declaration per Standard Building Component is sufficient.
- Alternatively: Certificates/labels from recognised organisations responsible for issuing standards that confirm the content requirements of the indicator (see "DGNB label recognition" on the DGNB website)

Examples for quality level 2 "easy-to-recover building structure" and quality level 1 can be found in the "TEC1.6 calculation tool".

Indicator 3: Ease of recovery, conversion and recycling in the planning process

- Statement declaring project-specific application of evaluation methods for the ease of recovery and recycling in early planning phases to optimise the resource efficiency, including a confirmation by the auditor that the optimisation was actually carried out in the (preliminary) draft planning phase.
- Statement declaring project-specific application of evaluation methods for the ease of recovery and recycling in the detailed design phase – to optimise the resource efficiency, including a confirmation by the auditor that the optimisation was actually carried out in the detailed design phase.
- Statement declaring that the type of evaluation method used supports the intended objective of the criterion.
- Optimisations for a relevant scope but not necessarily the complete scope of the building structure must be documented (e.g. definable via mass share or share of Standard Building Components, etc.).

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
536	General: scheme “Assembly buildings” has been added	16.09.2021
536	Shares of total score have been corrected	16.09.2021
all	Evaluation indicator 1 and 2: standard building component “external wall” has been modified / divided into the external cladding and internal lining	16.09.2021
all	Evaluation indicator 1 and 2: standard building component “Roof” has been modified / divided into the roof coverings and roof linings	16.09.2021

II. Literature

Fundamental sources chosen from the available lists of substances and material data:

- Waste Framework Directive (2008/98/EC) revision, April 2008
- www.wecobis.de/service/lexikon/recycling-lex.html
- Sustainable Development Goals icons, United Nations/globalgoals.org
- The need for soil protection, legislation at EU level Position paper of the German Environment Agency, October 2018
- Biocidal Products Directive (528/2012/EC) https://echa.europa.eu/information-on-chemicals/biocidal-active-substances

TEC1.7

Immissions control

Objective

Our objective is to minimise disruption to the immediate surroundings of the building due to sound and light emissions. In addition, we wish to prevent negative impacts on people and nature due to noise and light from buildings.

Benefits

Measures to prevent/reduce sound emissions and adverse light conditions have a positive impact on the health and well-being of users and the surrounding environment. This increases the productivity of building users and reduces absenteeism. Preventing light pollution supports the stability of ecosystems and can reduce the subsequent social costs incurred as a result of damage.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO GERMAN SUSTAINABILITY STRATEGY	
Low	3.4	Reduce mortality from non-communicable diseases and promote mental health	15.1	Biodiversity
	15.5	Protect biodiversity and natural habitats		

Outlook

Thanks to ever emerging new research and solutions, available technical options are becoming increasingly sophisticated and tailored more closely to the needs of people and nature. In the industrial sector, a large extent of impacts and immissions can already be partially contained or prevented (e.g. urban factory). DGNB monitors these developments and will update the indicators of this criterion as required.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	**0.6%**	**1**
Consumer market **Shopping centre**	**1.4%**	**2**
Department stores		
Logistics **Production**		
Assembly buildings	**0.7%**	**1**

EVALUATION

A total of two indicators are specified for the evaluation. There is a total of 110 points in this criterion, of which a maximum of 100 points can actually be awarded.

NO.	INDICATOR	POINTS
1	**Noise immissions – immissions guide values**	
1.1	**Noise pollution reduction measures**	**Max. 70**
	Consumer market **Shopping centre** **Department stores** **Logistics** **Production buildings** **Office** **Education** **Residential** **Hotel** **Assembly buildings**	
	■ Compliance with the immissions guide values in accordance with Technical Instructions on Protection against Noise (TI noise) throughout the day and the night.	20
	■ Immissions values that fall below the immissions guide values in accordance with TI noise by at least 6 dB throughout the day and the night.	40
	■ Immissions values that fall below the immissions guide values in accordance with TI noise by at least 10 dB throughout the day and the night.	70
2	**Light pollution**	
2.1	**Light pollution reduction measures**	
	Consumer market **Shopping centre** **Department stores** **Logistics** **Production buildings** **Office** **Education** **Residential** **Hotel** **Assembly buildings**	**Max. 30**
	■ There is an implemented lighting concept that explicitly examines the issue of light pollution and its prevention, and focuses on minimising light trespass into neighbouring areas, for instance due to outdoor advertising, outdoor lighting, façade lighting and indoor lighting which has an external impact (excluding required safety lighting).	+15
	■ At least 80% of all illuminants or lights with external impact are designed to prevent upwards and lateral light scattering.	+5
	■ At least 80% of all illuminants or lights with an external impact are switched off or dimmed automatically or are equipped with motion sensors.	+5
	■ For all illuminants, care has been taken to reduce distracting glare effects.	+5
	■ A simulation has been carried out and the resulting potential for optimisation has been implemented	+10

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPIs) for communication include using the lighting concept described in indicator 2.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Over-fulfilment of the immissions control values in accordance with Technical Instructions on Protection against Noise (TI noise) (throughout the day and night)	[dB]
KPI 1	Share of the exterior illuminants where the issue of light pollution has been explicitly taken into account	[%]

Synergies with DGNB system applications

- **DGNB district:** Indicator 2 largely corresponds to indicator 8. "Light pollution reduction measures" in the criterion SOC1.9 Emissions/immissions for the Urban district scheme (UD16) and Business district scheme (BD16).

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

The productivity and satisfaction of users and neighbours are closely linked to influences and sensory perceptions from the surrounding environment. To ensure highest possible user acceptance, lowest possible negative impact due to noise and distracting lights should be ensured.

II. Additional explanation

The existing statutory immissions regulations should be complied with whenever possible. In addition, potential improvements for optimisation should be evaluated.

Definition of emissions
In accordance with German Federal Immission Control Act (BImSchG), any air pollution, odours, noises and similar occurrences emanating from technical systems, commercial and industrial facilities or vehicles are referred to as emissions.

Definition of immissions
Conversely, immissions are defined by the Act as air pollution, noises, odours and similar environmental effects that affect people, animals and plants. In most cases, emissions also result in immissions.

III. Method

Indicator 1. Immissions guide values
The following values are taken into consideration:

- Noise emissions level NEL in dB(A)
- Sound power level SPL in dB(A)
- Sound power level with immission effect in dB(A)
- Operational period of the systems
- Assessed level as additional pollution
- Immissions guide value (IGV) in dB(A)

The evaluation is carried out via the difference established between the determined value and the immissions guide values from TI noise (Table 1). Noise protection measures that go beyond the minimum noise protection requirements result in a better evaluation for this criterion.

The difference between the determined value and the immissions guide value is determined via a noise protection expert report (noise immission projection) in accordance with TI noise.

Planning measures for minimising sound immissions include, for example, the positioning of sound sources in relation to neighbouring areas that require protection, the use of particularly quiet systems, and planning required additional structural measures, where necessary. Such measures include sound dampers, enclosures, encapsulation and noise protection walls and barriers.

Table 1: Immissions guide values from Technical Instructions on Protection against Noise

Expulsion	Daytime reference values (6:00 to 22:00)	Nighttime reference values (22:00 to 6:00)
Industrial area	70 dB(A)	70 dB(A)
Industrial estate	65 dB(A)	50 dB(A)
Urban area	63 dB(A)	45 dB(A)
Business, village and mixed area	60 dB(A)	45 dB(A)
General residential area	55 dB(A)	40 dB(A)
Residential area	50 dB(A)	35 dB(A)
Spa area, hospital and nursing home	45 dB(A)	35 dB(A)

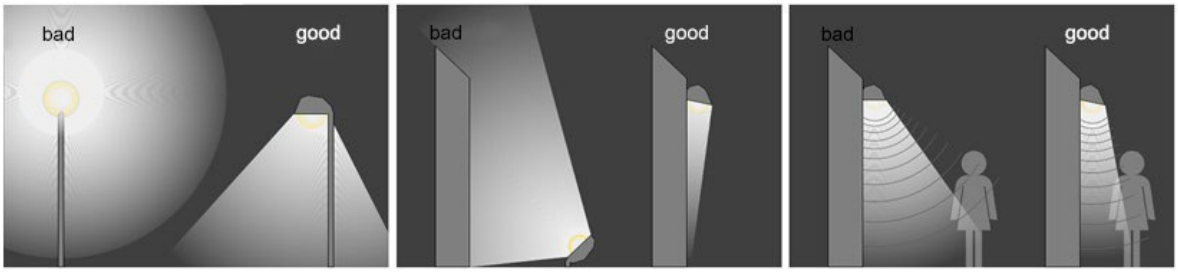
Indicator 2. Light pollution

Light pollution reduction measures

Light is defined as the intolerable illumination of a living or working area inside a building and increased illumination of outdoor areas by external light sources. Residential buildings in the immediate vicinity of a department store, for instance, are particularly affected by this.

Light pollution at the site is evaluated in qualitative terms. Outdoor lighting systems and indoor lighting systems with an external impact are evaluated. The objective is to prevent light from scattering upwards or laterally as far as possible. The illuminance should also be adjusted to the actual light conditions. Consequently, lights that feature low upwards and lateral light scattering and can automatically adjust their light intensity to suit the surrounding conditions are classified as good. In addition, motion sensors, for instance, should be positioned in such a way that unnecessary activation is prevented.

A lighting concept should explicitly examine the issue of light pollution and its prevention. The objective is to ensure the lowest possible illumination due to outdoor advertising, outdoor lighting, façade lighting and indoor lighting with an external impact (excluding required safety lighting), for example.



Lighting examples (source: Büro Faerber based on Przygoda)

It is not always possible to ensure sufficient illumination and also prevent disruptive effects. Adoption of different measures may lead to compliance with these comfort values. Measures to prevent direct lines of sight to light sources include selecting an appropriate site, ensuring that lights are positioned at optimal heights, ensuring that lights have suitable angles of inclination, implementing screening measures and more. Light emissions can also be reduced by limiting the times at which lights are switched on, using many distributed smaller lights in place of a single larger light or through dimming measures.

Details regarding wildlife conservation can also be found in the guidelines "Bird-Friendly Building with Glass and Light", Schmid, H., W. Doppler, D. Heynen & M. Rössler (2012): Bird-Friendly Building with Glass and Light. Second, revised edition., Swiss Ornithological Institute, Sempach"

Required safety lighting is excluded from these provisions.

IV. Usage-specific description

The DGNB assessment of this criterion for mixed use buildings can be done on behalf of only one use, If different schemes of the above mentioned mix-use building can be assigned to this one use (main or secondary use (s)).

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements

Indicator 1. Immissions guide values

- Noise protection expert report
- Expert report regarding noise, in which the projected noise immissions from the building into neighbouring areas are specified as an assessed level in dB(A) and, if necessary, the additional pollution is determined. The report must state whether the minimum level of noise protection, i.e. the immissions guide values in TI noise, have been met or the extent to which the noise protection achieved falls below this minimum level.
- Declaration by an expert indicating that the immission locations are outside of the exposure zone of the system.

Indicator 2. Light pollution

- Documentation of measures against light pollution
- Proof of the lighting systems installed to date by means of data sheets and photo documentation
- Lighting concept
- If applicable, simulation results and presentation of the methodology

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
all	General and evaluation: Scheme “Assembly buildings” has been added	16.09.2021
561	Usage-specific description: clarification on evaluation of the mixed-use buildings	16.09.2021

II. Literature

- German Federal Immission Control Act (Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnliche Vorgänge – BImSchG). 26th September 2002 (BGBl. I No. 71 published 04.10.2002, P. 3830), last amended by Article 1 of the Act published 21st July 2011 (BGBl. I P. 1474)
- Sixth General Administrative Regulation to the Federal Immission Control Act (Technical instructions on protection against noise), published 26th August 1998; Gemeinsames Ministerialblatt (Joint Ministerial Gazette), 49th year, no. 26, published 28th August 1998
- DIN ISO 9613-2. Attenuation of sound during propagation outdoors – General method of calculation. Berlin: Beuth Verlag. October 1999
- RLS-90: "Richtlinien für den Lärmschutz an Straßen" [Guidelines for noise protection on roads], published 1990, introduced via letter no. 8/1990 – StB 11/14.86.22-01/25 Va 90 by the Bundesminister für Verkehr (Federal Minister for Transport) on 10th April 1990.
- DIN EN 12354-4. Estimation of acoustic performance of buildings from the performance of elements – Part 4: Transmission of indoor sound to the outside. Berlin: Beuth Verlag. April 2001
- Przygoda, Carsten (2013): Leuchtmittel und Lichtlenkung [Illuminants and light redirection]. URL: http://www.funnytakes.de/lichtverschmutzung/leuchtmittel-und-lichtlenkung.html
- Bird-Friendly Building with Glass and Light, Schmid, H., W. Doppler, D. Heynen & M. Rössler (2012): Bird-Friendly Building with Glass and Light. Second, revised edition, Swiss Ornithological Institute, Sempach, ISBN no.: 978-3-9523864-0-8

TEC3.1

Mobility infrastructure

Objective

Our objective is to save natural resources, reduce traffic-related emissions into the air, water and soil, increase user comfort via sustainable mobility infrastructure and to increase the opportunities for use of efficient and affordable mobility.

Benefits

Sustainable and smart traffic infrastructure enables users to select the mode of transport that best suits their individual needs. If the conditions necessary for using a wide variety of forms of mobility are established for the building, it is to be expected that the level of pollution and other negative impacts from motorised private transport will be reduced. In addition, doing so increases user satisfaction of the site and the building, expands the extent of affordable mobility and encourages health-promoting cycling and walking.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	3.4	Reduce mortality from non-communicable diseases and promote mental health	3.2.a/b	Air pollution
	3.9	Reduce illnesses and death from hazardous chemicals and pollution	11.2.b	Mobility
	9.1	Develop sustainable, resilient and inclusive infrastructures	13.1.a	Climate protection
	9.4	Upgrade all industries and infrastructures for sustainability		
	11.2	Affordable and sustainable transport systems		
	11.6	Reduce the environmental impact of cities		
Moderate	13.2	Integrate climate change measures into policies and planning		

Outlook

Mobility is currently in a period of upheaval (e.g. electromobility). Development will be closely monitored and adjusted as required.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	1.9%	3
Consumer market **Shopping centre** **Department stores**	2.1%	3
Logistics **Production** **Assembly buildings**	2.0%	3

EVALUATION

Mobility is intrinsically tied to the building and its infrastructure as a starting point and goal. It involves increasing the use of alternative modes of transport as well as ensuring that the building features good infrastructure and parking facilities for various means of transportation. This is a qualitative and quantitative method which evaluates the availability of appropriate facilities for the indicators of bicycle infrastructure, rental systems, electromobility and user comfort in the building. In this criterion, the total available points add up to 110 points; however there is a cap of maximum 100 points that can be attained. Including bonuses, a maximum of 120 points can be awarded for this criterion.

Note: In case one or more of the following indicators do not apply in a country, alternatives solutions proposed by a DGNB auditor could be taken into account for the evaluation of a project.

NO.	INDICATOR	POINTS
1	**Bicycle infrastructure**	
1.1	**Parking facilities**	**Max. 20**
	Parking facilities, clearly assigned to the building, are located in or around the building and are easily accessible	+5
	Anti-theft measures for bicycles and anti-vandalism measures for the parking facilities/spaces have been adopted	+5
	Maintenance facilities are available	+5
	Weather protection is available for the parking facilities/spaces (at least 80%)	+5
	Lighting is available for the parking facilities/spaces (at least 80%)	+5
2	**Rental systems (public or private)**	
2.1	**CIRCULAR ECONOMY BONUS – MOBILITY SHARING**	**+10**
	Parking spaces for mobility sharing (car, scooter, bike sharing, etc.) are available in the immediate vicinity of the entrance (max. 350 m)/easily accessible at the building, or the building is within the area of an operation of a free-floating sharing provider	
3	**Infrastructure for alternative drive systems**	
3.1	**Motorised private transport**	**Max. 30**
3.1.1	Development of a mobility management strategy	**+Max. 10**
	Mobility management strategy - charging infrastructure (variant A)	
	■ A mobility management strategy is available, which ensures the availability of the adequate number of charging stations. It should take into account the project-specific needs of the relevant criteria (considering future users, building typology, public transport connections, etc.). It also supports the goals of the national strategic framework for infrastructure creation for the alternative fuels and, if available, is based on measures derived at the municipal level for buildings and districts.	+5
	■ The mobility management strategy includes future developments and enables amendments for the future.	+5

NO.	INDICATOR	POINTS
	Mobility management strategy - no parking spaces (variant B)	
	■ Motorized private transport was deliberately avoided. Instead, an active contribution (e.g. loan systems, financing of a bus stop, improvement of the timing of local public transport) was made to develop and implement a mobility management strategy that enables building users to use non-motorized types of transport, public transport and / or loan systems to forego motorized private transport without compromising the comfort and quality. The infrastructure for electric two-wheelers should also be part of the mobility management strategy.	+10
3.1.2	Implementation of the mobility management strategy	**+20**
	■ The mobility management strategy (variant A or variant B) was fully implemented.	20
	AGENDA 2030 BONUS – CLIMATE PROTECTION GOALS	
	No parking spaces	**+10**
	■ The mobility management strategy, variant B was fully implemented	
	alternatively (without a mobility management strategy):	
	Parking spaces with charging and / or refuelling stations (plug type 2 with at least 22kW)	**10-30**
	■ for 1% (but at least 2 charging stations) - 50% of the car parking spaces, required by the local building code or realized (if there are no building code requirements), charging and / or fuelling stations are available.	10-30
	AGENDA 2030 BONUS – CLIMATE PROTECTION GOALS	
	Parking spaces with charging and / or refuelling stations (plug type 2 with at least 22kW)	**+10**
	■ for >75% (but at least 2 charging stations) of the car parking spaces, required by the local building code or realized (if there are no building code requirements), charging and / or fuelling stations are available.	
3.2	**Electric bikes / two-wheeler transport**	**5–30**
	■ for 1% (but at least 2 charging stations) - 50% of the bike / two-wheeler transport parking spaces, required by the local building code or realized (if there are no building code requirements), charging and / or fuelling stations are available.	5-30
3.3	**Electromobility: Integration of charging stations**	**Max. 20**
	■ Integration of the charging stations into the building energy management system	+10
	■ Integration of the charging stations into the networked charging management system, for 10 or more charging spaces	+10
	■ Integration of the charging stations into the billing system of the car park operator	+10
	■ Integration of the charging stations into a billing system with roaming capability	+10
3.4	**AGENDA 2030 BONUS – CLIMATE PROTECTION GOALS**	
3.4.1	Vehicle to grid:	**+10**
	Preparations are in place for **bidirectional** charging and discharging of electric vehicles.	
4	**User comfort**	
4.1	**User comfort inside the building**	**Max. 10**
	Shower facilities are available	+5
	Changing and drying rooms are available	+5

	Storage facilities are available	+5
	Parking spaces/facilities for mobility aids such as walking frames, prams, Segways, etc. are available	+10

Re 1–4	**INNOVATION AREA** Explanation: If there are measures implemented which encourages building users to extensively and regularly use environmentally friendly forms of transportation (non-motorised modes of transport, public transportation or rental systems) to travel to the building, these measures can also be evaluated positively in accordance with the objectives of the criterion and the evaluation of the other indicators. This is also possible in the section of electromobility (e.g. "Green logistics" that enable low-emission or emission-free delivery in inner city locations).	**As in 1–4**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The following aspects can be used for communication as key performance indicators (KPI):

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Number of high-quality parking facilities for bicycles	[Number]
KPI 2	Number of nearby parking spaces for car sharing	[Number]
KPI 3	Number of nearby parking spaces for bike sharing	[Number]
KPI 4	Number of car charging stations (standard and bidirectional)	[Number]
KPI 5	Percentage of car parking spaces pre-fitted for charging stations	[%]
KPI 6	Number of electric bike charging stations	[Number]
KPI 7	Percentage of electric bike parking spaces pre-fitted for charging stations	[%]

Synergies with DGNB system applications

- **DGNB DISTRICTS:** Indicators 1, 2, 3 and 5 are compatible with the content of criteria TEC3.1 and TEC3.2 (mobility infrastructure for motorised/non-motorised transportation) from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Mobility is currently an important site factor for buildings. The availability and of various forms of transportation and an efficient transport system concept increases the user comfort and convenience. The correspondingly high acceptance and take-up by users have a positive effect on the evaluation of a site and thus on the choice of site for a property.

II. Additional explanation

Mobility does not begin outside a building – hence adequate provisions must also be made available inside.

Flexibility and user-friendliness contribute to increased user acceptance.

Flexibility means accessibility to alternative modes of transport such as public transport, rental systems or mobility platforms, as well as satisfaction of the various individual mobility requirements, such as the use of electric vehicles in the form of electric cars, electric scooters or electric bikes.

User-friendly profile includes access to passenger information and the routing within a building, easy access to storage areas for mobility aids such as walking frames, prams, bicycles or el. scooters, as well as user comfort and convenience within the building via the provision of shower facilities, and changing and drying rooms.

III. Method

Infrastructure for modes of transport at the site:

Indicator 1. Bicycle traffic infrastructure
This indicator is evaluated by means of assessing parking spaces, maintenance facilities, weather protection and lighting.

- Parking facilities: Available in sufficient quantity and quality in accordance with local guidelines / standards. The result based on reference values must be increased or reduced if, in individual cases, the result is grossly disproportionate to the requirements derived from the existing or expected number of bicycles for users and visitors to the building.

Alternatively, the following recommendations for determining space requirements can be used:

- Instructions for planning bicycle parking facilities and Technical Guidelines TR 6102 from the German Cyclist's Association (ADFC): http://www.adfc.de/files/2/110/111/TR6102_0911_Empfehlenswerte_Fahrrad-Abstellanlagen.pdf
- Bicycle Parking Manual by the Danish Cycling Federation: http://www.cycling-embassy.dk/wp-content/uploads/2010/08/Bicycle_Parking_Manual.pdf
- "Making Buildings Fit for Sustainable Mobility" report from the European Cyclists´ Federation (ECF): https://ecf.com/system/files/Bicycle%20vs%20Car%20Parking%20in%20Building%20Codes_ECF_ONLINE.pdf
- Other comparable international / local guidelines, standards, etc.

A requirement for the evaluation of this indicator is documentation that the bicycle parking facilities contain an appropriate number of bicycle parking spaces.
The design of the parking facilities must be as vandal-proof as possible and includes anti-theft measures for bicycles.

- Maintenance facilities: the area in or around the building can be easily accessed by cyclists in case of need, which is reserved exclusively for bicycle servicing. This area should be protected from the weather, easy to find, well lit, and should be equipped with simple maintenance tools, such as a bicycle mount and an air pump.

- Weather protection: the extent of weather protection for the parking facilities/spaces is evaluated.

- Lighting: the extent of lighting for the parking facilities/spaces is evaluated.

Indicator 2. Rental systems (public or private)

- Evaluation points are awarded for the availability of rental systems that are within walking distance from the building.

Indicator 3. Electromobility in the buildings and on the premises
This indicator is evaluated on the basis of an assessment of the amount of (pre-fitted) charging stations for motorised private transport and electric bicycles in and around the building. The objective is to maintain a comprehensive network of charging infrastructure, enabling all users (residents, workers, visitors, etc.) to charge their electric vehicles at any time, and in accordance with local standards that vehicles can be charged anytime, anywhere. The following aspects are evaluated:

- Support and installation of infrastructure facilities in and around the building in the form of charging stations, or pre-fitting of charging stations, for car parking spaces
- Support and installation of infrastructure facilities in and around the building in the form of charging stations, or pre-fitting of charging stations, for electric bike parking spaces

Please note:

- Recommendations for the qualitative and quantitative planning of electrical systems in buildings with regard to electric mobility are provided in VDI 2166 Sheet 2. These recommendations also make reference to relevant European Standards.
- Integration of charging stations into the building energy management system should be included in the planning process as early as possible (e.g. for using electricity generated within the building itself).
- Integration into billing systems with roaming capability is important in particular for charging systems intended for public use.
- The layout and dimensioning of the parking spaces must enable unimpeded charging. This means that parking spaces should ideally have a width of 3.0 m.

For the Agenda 2030 Bonus: V2G (vehicle-to-grid), preparations for bidirectional charging and discharging of electric vehicles must be documented.

Indicator 4. User comfort inside the building

This indicator is evaluated by means of assessing shower facilities and storage and parking spaces.

- Shower facilities
- Changing rooms and drying rooms
- Storage facilities
- Parking/storage facilities for mobility aids such as walking frames, prams, Segways, etc. are available

Indicator 5. Innovation area

If there are measures implemented which encourages building users to extensively and regularly use environmentally friendly forms of transportation (non-motorised modes of transport, public transportation or rental systems) to travel to the building, these measures can also be evaluated positively in accordance with the objectives of the criterion and the evaluation of the other indicators. This also applies in the section of electromobility (e.g. "Green logistics" => low-emission or emission-free delivery in inner city locations).

IV. Usage-specific description

–

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1. Bicycle infrastructure

- Parking facilities documentation: In a sufficient quantity and quality in accordance with regional building regulations or corresponding implementation regulations
- A requirement for the evaluation is the documentation that the bicycle parking infrastructure contains an appropriate number of bicycle parking spaces.
- Documentation on the number and location of the bicycle parking spaces, e.g. via floor plans and photo documentation
- Documentation on bicycle maintenance facilities via site plan and photo documentation

Indicator 2. Rental systems

- Documentation via screenshot of the area of operation, photo documentation and site plan

Indicator 3. Electromobility equipment in the buildings and on the premises

- The existence of cable routing to the parking space must already be documented for the pre-fitting
- A rough assessment of the power requirements and documentation of availability of the required electrical power with the public utilities provider are also required for the preparations, e.g. via electrical planning concept and documentation of coordination
- Documentation via site plan, photo documentation
- Documentation on the charging stations (see also VDI 2166 sheet 2. Planning of electrical installations in buildings – Advice for electric mobility)
- Performance documentation on the integration into billing systems with roaming capability
- Preparations are in place for bidirectional charging and discharging of electric vehicles (Agenda 2030 Bonus)

Indicator 4. User comfort inside the building

- Documentation via site plan, photo documentation

Indicator 5. Innovation area

- Documentation via site plans, photo documentation and other appropriate documentation

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
565	General: Scheme “Assembly buildings” has been added	16.09.2021
all	Complete revision of the Indicator 3	

II. Literature

- VDI guideline VDI 2166 sheet 2: Planning of electrical installations in buildings – Advice for electric mobility. Verein Deutscher Ingenieure e.V. October 2015
- VDI-Richtilinien im DGNB Zertifizierungssystem. Paragraph 4.3 “TEC3.1: Möbilitätsinfrastruktur” Verein Deutscher Ingenieure e.V. June 2012 (this book is written in both German and English).
- Federal programme for charging infrastructure (BMVI programme 2017): https://www.bmvi.de/EN/Topics/Mobility/Electric-Mobility/Electric-Mobility-In-A-Nutshell/electric-mobility-in-a-nutshell.html
- “Making Buildings Fit for Sustainable Mobility” report from the European Cyclists´ Federation (ECF): https://ecf.com/system/files/Bicycle%20vs%20Car%20Parking%20in%20Building%20Codes_ECF_ONLINE.pdf
- Bicycle Parking Manual by the Danish Cycling Federation: http://www.cycling-embassy.dk/wp-content/uploads/2010/08/Bicycle_Parking_Manual.pdf

Process quality

The nine criteria of process quality aim to increase the **planning quality** and the **construction quality assurance**.

PRO1.1	Comprehensive project brief
PRO1.4	Sustainability aspects in tender phase
PRO1.5	Documentation for sustainable management
PRO1.6	Procedure for urban and design planning
PRO2.1	Construction site/construction process
PRO2.2	Quality assurance of the construction
PRO2.3	Systematic commissioning
PRO2.4	User communication
PRO2.5	FM-compliant planning

PRO1.1

Comprehensive project brief

Objective

Our objective is to ensure that the quality of the building is as high as possible by means of an optimised, transparent planning process and by defining the relevant general conditions early on (during "Phase 0" or pre-planning phase).

Benefits

The requirements of building owners with regard to the building, and the resulting planning objectives are clearly set out in the form of requirements planning and the specifications used for the planning process. This allows the building owners' requirements to be fulfilled consistently. This project preparation has a direct influence on the final building quality. Seeking greater public input can also play a key role in increasing the acceptance of decisions, devising a more balanced solution, improving decision-making, reducing conflicts and encouraging local residents to identify more strongly with the environment they reside in and go about their day-to-day business.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)	CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY
Low	11.3 Inclusive and sustainable urbanisation	

Outlook

New planning methods involving building information modelling (BIM) may affect preliminary planning processes in the future. DGNB is keeping these in mind and may incorporate amended planning processes in the future.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production** **Assembly buildings**	**1.6%**	**3**

EVALUATION

To ensure that the quality of the building is optimal, three indicators are used to evaluate the extent to which the relevant general conditions have been established early on. Indicator 1 is used to evaluate the extent to which requirements planning has been undertaken. Indicator 2 is used to award points for measures implemented to inform the public. The integration of a detailed description of sustainability requirements into the specifications is credited using indicator 3. In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**Requirements planning**	
1.1	**Scope of requirements planning**	**Max. 40**
	■ A requirements description based on Appendix 1a of this criterion or a comparable scope is carried out by the end of service phase 2 “Concept design” [T&D_01] at the latest.	10
	■ A small-scale requirements planning based on Appendix 1b of this criterion or a comparable scope is carried out by the end of service phase 2 “Concept design” [T&D_01] at the latest.	20
	■ A large-scale requirements planning to establish the builder´s requirements based on Appendix 1c of this criterion or a comparable scope is carried out by the end of service phase 2 “Concept design” [T&D_01] at the latest.	40
2	**Informing the public**	
2.1	**Measures for working with the public**	**Max. 20**
	■ Various measures have been implemented to inform the general public.	+10
	■ People in the immediate neighbourhood have been informed about the construction work (e.g. duration, anything particular that needs to be noted) and a contact person has been appointed to answer any queries.	+10
3	**Specifications**	
3.1	**Sustainability requirements in the specifications**	**Max. 40**
	■ Specifications have been drawn up, with detailed requirements regarding the building's sustainability. Ecological, economic, sociocultural and functional aspects have been taken into consideration, as well as technical aspects and the planning and construction process.	25
	■ In addition, responsibilities have been defined and information has been provided on the planning phases that are crucial to the project in the specifications.	40

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Not available.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT

Synergies with DGNB system applications

- **DGNB INTERIORS:** Indicator 3 corresponds to the content of indicator PRO1.1.2 from the scheme for interiors.
- **DGNB RENOVATED BUILDINGS:** Indicators 1, 2 and 3 correspond to the content of criterion PRO1.1, indicators 1, 3 and 4 from the scheme for renovated buildings.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

The requirements planning assists in establishing the requirements, objectives, and constraints of the building owner and other important participants. In this way, it is possible to identify all the problems for which a solution is expected from the architect.

The requirements planning is not identical to the architect's fundamental planning; it assists much more in the formulation of requirements on the part of the building owner at the start of a construction project. Requirements planning is essentially more than purely setting down the areas required. It provides basis of objective focused planning which takes the requirements of the building owner into consideration without restricting the freedom of the planners.

II. Additional explanation

–

III. Method

Indicator 1: Requirements planning
The evaluation examines whether and what extent requirements planning has been undertaken. The extent of this can vary from project to project. The appendix to this criterion lists topics and possible content as starting points for requirements planning; one of the objectives here is that the builder addresses the requirements early on, and appropriate project-specific issues should be taken into consideration. Requirements planning must be undertaken at the initiation phase of project, and completed no later than service phase 2 “Concept design” [T&D_01]. The architectural brief is the end result of the requirements planning phase.

Indicator 2: Informing the public
The evaluation examines the measures implemented to inform the public.

Public consultation is mandatory for certain building and planning projects (formal consultation). While the consultation rights, the procedure and the manner in which results are utilised are stipulated by law in these mandatory processes, these matters can still be addressed in various ways, through voluntary, informal processes, depending on the circumstances.

Examples of this include:

- Notices (e.g. construction site signs) with important information about the project (e.g. its use upon completion, construction duration, building owner, contact person, warnings regarding noisy work)
- Circulars or letters sent directly to people living in the neighbourhood, containing important information on the project
- Information events
- Building site visits for the public

A combination of different measures may be more beneficial, depending on the project and the scope of the measures implemented.

Indicator 3: Specifications

The purpose of the specifications is to set out in detail the planning objectives identified in the early project phase.

In order to more effectively fulfil the objectives, the project phase in which crucial steps should be taken to achieve these objectives can be stipulated in the specifications.

One of the things that the evaluation particularly focuses on is whether concrete objectives have been set out for the various sustainability aspects. The specifications mentioned can be based, for example, on the criteria in the DGNB certification system or the "Guideline for Sustainable Building issued by the German Federal Ministry of the Interior, Building and Community or other comparable documents. Besides the objectives, the specifications should also define and describe the responsibilities.

APPENDIX 1

Appendix 1a Requirements description

A requirements description in the sense of this criterion should contain the following points at the very least:

1. Requirements description

Typical/possible content:

- Main objectives of the project
- Size
- Quality
- Financial framework
- Time frame
- Current planning status of the project
- Future changes

Appendix 1b Small requirements planning

A small requirements description in the sense of this criterion should contain the following points at the very least:

1. Requirements description

Typical/possible content:

- Main objectives of the project
- Size
- Quality
- Financial framework
- Time frame
- Current planning status of the project
- Future changes

2. Financial and time framework

Typical/possible content:

- Schedule
- Budgets
- Costs
- Financial and time risks

3. Priorities

Typical/possible content:

- Added value
- Time
- Costs
- Quality

4. Plot and surroundings

Typical/possible content:

- Access
- Transport
- Parking

5. The building as a whole

Typical/possible content:

- Characteristics of the structural shell
- Dimensions
- Volume
- Number of floors
- Construction phases
- Energy
- Flexibility for future usage

6. Access for all

Typical/possible content:

- Disabled access, equipment, workplaces

7. Individual rooms

Typical/possible content:

- Characteristics
- Connection to other rooms

Appendix 1c Extensive requirements planning

An extensive requirements planning in the sense of this criterion should contain the following points at the very least:

1. Requirements description

Typical/possible content:

- Main objectives of the project
- Size
- Quality
- Financial framework
- Time frame
- Current planning status of the project
- Changes in the future

2. Financial and time framework

Typical/possible content:

- Schedule
- Budgets
- Costs
- Financial and time risks

3. Priorities

Typical/possible content:

- Added value
- Time
- Costs
- Quality

4. Participation

Typical/possible content:

- User participation
- Public participation

5. Effects on users and on the public

Typical/possible content:

- Suitability of rooms and systems
- Safety
- Comfort
- Health
- Aesthetics
- Image

6. Effects on the environment

Typical/possible content:

- Ecology
- Control of undesirable effects

7. Plot and surroundings

Typical/possible content:

- Access
- Transport
- Parking

8. The building as a whole

Typical/possible content:

- Characteristics of the structural shell
- Dimensions
- Volume
- Number of floors
- Construction stages
- Energy
- Flexibility for future uses

9. Access for all

Typical/possible content:

- Disabled access, equipment, workplaces

10. Individual rooms

Typical/possible content:

- Room requirements plan with qualitative requisitioning as room requirement specifications. The area ratio of usable area UA [T&D_04] to gross floor area GFA [T&D_04] is to be indicated as a planning specification on the basis of benchmarks.
- Requirements for the individual rooms must be defined in line with the following characteristics as a minimum:
- spatial ability to be modified
- Room height/headroom
- Lighting
- Indoor climate
- Surfaces
- Ceiling loads

APPENDIX 2 – Documentation template
Indicator 1: Requirements planning

Confirmation for PRO1.1: Requirements planning

We hereby confirm that, as part of the planning process for the project entitled

[project name] _____,

with agreement number _____,

requirements planning has been undertaken in line with the scope and quality of one of the evaluation levels below.

PLEASE CROSS WHERE APPRO-PRIATE	DESCRIPTION	POINTS
☐	A requirements description based on Appendix 1a of this criterion or a comparable scope was carried out by the end of service phase 2 “Concept design” [T&D_01] at the latest.	10
☐	A small-scale requirements planning based on Appendix 1b of this criterion or a comparable scope was carried out by the end of service phase 2 “Concept design” [T&D_01] at the latest.	20
☐	A large-scale requirements planning to establish the builder´s requirements based on Appendix 1c of this criterion or a comparable scope was carried out by the end of service phase 2 “Concept design” [T&D_01] at the latest.	40

A brief description of the methods employed as part of the project preparation (market analysis, environmental compatibility study, schedules of accommodation, expert site reports, cost estimates, capital budgeting, etc.) must be included with the documentation submitted for the purposes of the conformity assessment.

_____

Date Signature Building owner Stamp

The auditor hereafter confirms that they have checked that the information contained in the relevant documents is a true and fair representation of the reality.

_____

Date Auditor's signature Stamp

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The allocation of points for individual indicators must be backed up by comprehensive and credible evidence.

Indicator 1: Requirements planning

- The requirements planning or other documents which show the scope (see Appendix 1) and when the requirements planning is implemented (e. g. extracts from records).
- Appendix 2, incl. a brief description of the methods employed (market analysis, environmental impact assessment, schedules of accommodation, expert site reports, cost estimates, capital budgeting, etc.). The DGNB reserves the right to request individual pieces of documentation on a random basis at a later date as part of the conformity assessment.

Indicator 2: Informing the public

- Documentation of the measures implemented to inform the public
- Photo documentation of the construction site sign

Indicator 3: Specifications

- Specifications setting out the concrete objectives for the sustainability aspects and responsibilities

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
576	General: scheme “assembly buildings” has been added	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org
- Guideline for Sustainable Building. German Federal Ministry of the Interior, Building and Community (BMI). February 2016. https://www.nachhaltigesbauen.de/fileadmin/pdf/Systainable_Building/LFNB_E_160309.pdf
- ISO 9699. Performance standards in building – Checklist for briefing – Contents of brief for building design, 1994

PRO1.4

Sustainability aspects in tender phase

Objective

Our objective is to integrate sustainability aspects early on, right from the tender phase, in order to ensure that all decisions take an integrated holistic approach.

Benefits

Integrating sustainability aspects into the tender phase improves the quality of the building and ensures that decisions regarding product quality are no longer based exclusively on economic considerations.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
1 Low	12.2	Sustainable management and use of natural resources	12.1.a	Sustainable consumption
	12.5	Substantially reduce waste generation	12.2	Sustainable production

Outlook

Ideally, this criterion will no longer be needed in a few years' time, when the addressed topics have become standard practice.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Production, Assembly buildings	1.6%	3

EVALUATION

The extent of early integration of sustainability aspects into the tender phase is evaluated in indicator 1. An additional 10 points can be awarded for the circular economy bonus – recycling materials. In this criterion, 100 points can be achieved, or a maximum of 110 points including bonus points.

NO.	INDICATOR	POINTS
1	**Sustainability aspects in tender phase**	
1.1	Extent of integration of sustainability aspects in tender phase	**Max. 100**
	■ Selected sustainability aspects with regard to the impact on health or environment, or alternatively relevant technical aspects for increasing sustainability have been integrated into the tender specifications in the form of general preliminary remarks.	10
	■ Requirements with regard to the impact of construction products on health and environment have been integrated into the tender phase in the form of general preliminary remarks.	50
	■ Requirements with regard to the impact of construction products on health and environment have been set out specific to trades and, in selected cases, also integrated into the individual service items in the tender phase. Functional invitations to tender must be issued along with a list of specific recommendation/exclusion criteria that apply to the choice of construction products.	75
	■ In addition to requirements with regard to the impact of construction products on health and environment, technical aspects (e.g. durability, ease of cleaning, maintenance or recovery) have also been set out for each of the trades and, in selected cases, also integrated into the individual service items in invitation to tender. Functional invitations to tender must be issued along with a list of specific recommendation/exclusion criteria that apply to the choice of construction products.	100
1.2	**CIRCULAR ECONOMY BONUS – RECYCLING MATERIALS** No exclusion of recycled mineral materials in tender phase. Explanation: A bonus can also be awarded if requirements in the tender phase explicitly recommend/request the reuse or use of recycled/secondary (post-consumer) materials for mineral construction products.	**+10**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Not available.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT

Synergies with DGNB system applications

- **DGNB RENOVATED BUILDINGS:** Indicator 1 corresponds to the content of indicator PRO1.4.1 from the scheme for renovated buildings.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

The finished construction is significant for sustainability. The way sustainability aspects are addressed is important, from the objective planning stage right through to the implementation stage.

II. Additional explanation

–

III. Method

Indicator 1: Sustainability aspects in tender phase
It is checked whether sustainability aspects are integrated into the tender. For this purpose, meaningful extracts from the tender must be submitted.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1: Sustainability aspects in tender phase

- Extracts from the tender documents such as example service item texts, additional technical preliminary remarks or particular contractual conditions, which illustrates the required integration of sustainability aspects.

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APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
589	General: scheme “assembly buildings” has been added	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

PRO1.5

Documentation for sustainable management

Objective

Our objective is to ideally operate the building as soon as it is complete, and to ensure that the building's planned performance is attained in reality, with as little deviation as possible from the plans. In order to achieve this, all the relevant information must be provided to the owner, tenant and facility manager in a clear and organised format.

Benefits

Having all the relevant information available is key to ensuring that the building can be operated efficiently. This allows the operation of the building to be planned, and any particular issue to be dealt with, at an early stage.

Contribution to overriding sustainability goals

No direct contribution to Sustainable Development Goals (SDGs) of United Nations (UN).

Outlook

Ideally, this criterion will no longer be needed in a few years' time, when the addressed topics have become standard practice.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Production, Assembly buildings	1.1%	2

EVALUATION

A total of four indicators are used to evaluate the sustainable management requirements, which are established shortly after building work is completed. In addition to the production and provision of maintenance, inspection, operating and care instructions, which are credited in indicator 1, the plans are evaluated using indicator 2 to establish whether they are up-to-date. Indicator 3 covers the production and provision of a manual to the facility manager. Indicator 4 awards points for the production and provision of a BIM model to the facility manager. In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**Maintenance, inspection, operating, and care instructions**	
1.1	**Production and provision of maintenance, inspection, operating and care instructions**	**Max. 30**
	■ Provision of maintenance, inspection, operating and care instructions to the appointed service provider(s)/executive party/parties.	+15
	■ Production of maintenance and inspection schedules for building components that are subjected to mandatory servicing, testing and inspection and listed in the cost groups "Structural components – construction works" and "Technical components – installations" [T&D_05].	+15
2	**Up-to-date plans**	
2.1	**Updating of plans, documentation and calculations to reflect the building as it was actually built, and provision of these to the building owner**	**Max. 30**
	■ The plans reflect the building as it was actually built and are provided to the building owner.	+15
	■ The relevant documentation and calculations, such as the energy performance calculations [T&D_03], sound insulation documentation, interior acoustics documentation, fire safety concept, thermal simulation, daylight simulation, etc., reflect the building as it was actually built and have been prepared accordingly for the operation of the building and are provided to the building owner.	+15
3	**Facility management manual**	
3.1	**Production and provision of a facility management manual**	**20**
	A manual has been produced and provided to the facility manager (FM).	
4	**Planning with BIM**	
4.1	**Execution of planning with BIM and provision of the BIM model**	**5–20**
	■ Planning has been executed with BIM and a copy of an up-to-date partial model has been provided to the facility management firm and to the owner (5 points for each relevant partial model, e.g. for different building or technical components).	5
	■ Planning has been executed with BIM and a copy of the up-to-date complete model has been provided to the facility management firm and to the owner.	20

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Not available.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT

Synergies with DGNB system applications

- **DGNB BUILDING IN USE:** The results for indicator 3 can be used in indicator 9.2.2.2.4 from the scheme for buildings in use.
- **DGNB INTERIORS:** Indicators 1, 2 and 3 largely correspond to the content of criterion PRO8.1, indicators 2.2, 2.3 and 2.4 from the scheme for interiors.
- **DGNB RENOVATED BUILDINGS:** Indicators 1, 2 and 3 largely correspond to the content of criterion PRO1.5, indicators 2, 3 and 4 from the scheme for renovated buildings
- **DGNB DISTRICTS:** There are similarities between indicator 3 and criteria PRO1.2 and PRO3.5 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Full documentation of the maintenance, inspection, operating and care instructions for the building plays a key role in ensuring that the building is being operated efficiently.

Additionally recommended courses of action with regard to the use of the building, e.g. in the form of user or tenant manuals and guides, provide important information on specific aspects of the building.

II. Additional explanation

Indicator 1: Maintenance, inspection, operating and care instructions
Complete documentation of the building related maintenance, inspection, operating, and care instructions can make an important contribution to the efficient operation of the building, and thus, has a positive influence on reducing life cycle costs.

Most components of a building must be given regular care and maintenance. This can be labour intensive to a greater or lesser extent, depending on the component. Hence, it should be carried out by various parties at defined intervals. A precise description of these maintenance, inspection, operation, and care instructions referring to the respective actor is necessary for the orderly operation of a building. However, not only do these documents have to be created, but also administered and archived.

Indicator 2: Up-to-date plans
Detailed, updated planning documents and calculations assist in confirming the target aimed for in planning. They are also important basis for modernisation, revitalisation or renovation work in later life cycle phases; therefore they must be kept up to date. In order to have an efficient facility management, it is necessary that documents and plans are provided in a clear, uniform and structured manner, so that independent third party could find their way around the documentation.

Indicator 3: Facility management manual
The facility management manual (or any other comparable document) provides the building's facility manager with various information relevant to their work. All essential elements of a building operation should be described in this document and it should have an added value for the late building operation. The scope of the operator's manual can vary depending on the complexity of the building.

One of the purposes of the facility management manual is to explain the technical aspects of the building technology and the specific characteristics of individual components. This could refer to windows or HVAC systems, for example.

III. Method

Indicator 1: Maintenance, inspection, operating and care instructions
The content and scope of the documentation are examined. Documentation can also be submitted in the form of provisional documents with the assurance, that these documents will be completed no more than six months after completion of the building work.

In addition to a list of building components that are subjected to mandatory servicing, testing and inspection and included in the cost groups “Structural components – construction works” and “Technical components – installations” [T&D_05], the maintenance and inspection planning should include a payment plan for the building's projected service life based on a detailed calculation of the life cycle costs, and the duration after which elements/building components must be replaced should be specified, along with the estimated costs.

Indicator 2: Up-to-date plans
All planning documents are checked to ensure they have been updated and prepared for usage as appropriate once the building work is complete.

Indicator 3: Facility management manual
It will be checked whether a facility management manual has been produced and provided, and that the information and specifications it contains facilitate the operation of the building.

Indicator 4: Planning with BIM
It is checked whether the planning has been conducted with BIM and that the up-to-date model has been provided to the facility management firm and to the owner. If only a partial model of the building has been generated with BIM and then provided to the facility management firm and the owner, partial credit can be given if its relevance can be verified.

APPENDIX 1

Template for verification of indicator 2:
Preparation of maintenance, inspection, operating and care instructions

Principal client PRO1.5
Preparation of maintenance, inspection, operating and care instructions

Hereby confirm:

_____,that in addition to the existing project's documentation
(Owner's name)

Project name: _____

Contract number: _____

maintenance, inspection, operating and care instructions to be provided within 6 months after the completion, in terms of scope and quality to comply with the requirements of the following assessment level. The corresponding services were contracted with the qualified planners.

REQUIREMENTS						POINTS (TO INSERT)	REQUIREMENTS FULFILLED
Use, maintenance and care instructions are created to the usual extent, i.e. the use, maintenance and care instructions are documented and available for the executive service providers. Alternatively, it can be proven that maintenance contracts are agreed with companies / service providers who have the appropriate expertise.						25	☐
Detailed maintenance, inspection, operating and care instructions are created and implemented in the maintenance and operation plan, and they are specified individually for different target groups (facility management, caretaker, user, cleaning company, etc.),						40	☐

_____

Date Owner's signature Stamp

The Auditor confirms that he/she has verified the plausibility of relevant documents.

_____

Date Auditor's signature Stamp

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1: Maintenance, inspection, operating and care instructions
The documentation includes:

- Use, maintenance and care instructions that have been produced
- Maintenance agreements that have been concluded
- Maintenance and inspection schedule that has been drawn up, including the maintenance and inspection cycles, and the qualifications that must be held by the people/companies appointed to undertake the work

  Alternatively:

- Appendix 1 plus provisional documentation

Confirmation of receipt of the documentation by the building owner or service provider is sufficient documentation for the DGNB certification body.

Indicator 2: Up-to-date plans

- Documentation that contains plans and calculations which reflect the building as it was actually built, e.g. in the form of confirmation by the specialist designers and plans

Confirmation of receipt of the documentation by the building owner or service provider is sufficient documentation for the DGNB certification body.

Indicator 3: Facility management manual

- Manual produced for the facility manager

Confirmation of receipt of the documentation by the building owner or service provider is sufficient documentation for the DGNB certification body.

Indicator 4: Planning with BIM
Confirmation by the client/building owner that the facility manager and owner have an up-to-date copy of the BIM model.

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
596	General: scheme “assembly buildings” has been added	16.09.2021
599	Indicator 3: additional information to the Facility management manual	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

PRO1.6

Procedure for urban and design planning

Objective

Our objective is to create sustainable buildings that people will enjoy using for a long time. Sustainability and *Baukultur** are mutually dependent and are inextricably linked. Against this backdrop, DGNB's objective is to improve the design quality of our built environment.

**Baukultur* includes all elements of the built environment and goes far beyond the architectural design of buildings. It includes, for example, urban and town planning, transport and infrastructure planning by engineers and, in particular, integrated public art. As an extended concept of culture, the identity of the *Baukultur* is thus also based on the history and tradition of a country or region.

Benefits

Planning competitions allow the building owner to identify the most suitable contractor and the design that best fits their requirements by means of a clear, structured and transparent process. The competitive aspect boosts design quality and allows the building owner to choose the most ideal solution from the wide range of solutions offered. The result of this design quality boost is a diverse built environment.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)	CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY
Low	11.3 Inclusive and sustainable urbanisation	

Outlook

This criterion is one of DGNB's primary concerns and will therefore always play a key role in DGNB certification system. There are currently no plans to make any of the requirements in this criterion significantly stricter in the next few years.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Production, Assembly buildings	1.6%	3

EVALUATION

The evaluation examines the design procedures that have been adopted in order to achieve a high-quality building design that integrates well into the built environment; it also assesses the extent to which this has fostered widespread acceptance and ensured that the building will be used for a long time. The evaluation assesses the exploration of different design variants, planning competitions and subsequent commissioning of the prize winners, including the specialist design team and implementation of the winning design. The incorporation of recommendations by independent design committees, such as design recommendations by DGNB commission, or awards in the form of architecture prizes, such as the "DGNB Diamond" Award (currently available only in Germany and Denmark), can also be credited. A maximum of 100 points in total can be awarded for this criterion.

NO.	INDICATOR	POINTS
1	**Exploration of different design variants or planning competition**	
1.1	**Prior exploration of different design variants**	**10**
	Different design variants have been explored (no planning competition).	
	Alternatively:	
1.2	**Planning competition**	**Max. 85**
1.2.1	Scope and quality of the planning competition	**+Max. 20**
	■ Planning competition is held	15
	■ Planning competition is held, with a special focus on sustainable buildings	20
1.2.2	Type of competition held	**+Max. 35**
	■ Cooperative process	15
	■ Open competition (single-stage or two-stage) or restricted competition with preliminary application procedure (single-stage or two-stage; with preliminary application procedure)	35
1.2.3	Implementation of a winning design	
	Prize winner commissioned and winning design implemented	**+Max. 20**
	■ Until at least service phase 3 “Developed design” [T&D_01]	10
	■ Until at least service phase 5 “Technical Design” [T&D_01]	15
	■ Until at least service phase 8 “Construction” [T&D_01]	20
1.2.4	Commissioning of the planning team	
	Prize winner's specialist design team commissioned	**+Max. 10**
	■ Until at least service phase 3 “Developed design” [T&D_01]	5
	■ Until at least service phase 5 “Technical Design” [T&D_01]	7.5
	■ Until at least service phase 8 “Construction” [T&D_01]	10
	Please note: Indicators 1.2.2–1.2.4 can only be credited if a planning competition in accordance with indicator 1.2 has been held.	
2	**Recommendations by an independent design committee**	**Max. 15**
2.1	Project is presented before a design committee of the municipalities and chambers of architects.	**+5**
2.2	Design recommendations of the design committee are implemented.	**+10**

Alternatively:

3	**Award in the form of an architecture prize**	
3.1	**Recognition/award**	**Max. 100**
3.1.1	Recognition in terms of good design and *Baukultur**	40
3.1.2	Award for the completed project (e.g. architecture prize, "DGNB Diamond" Award)	100

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Not available

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT

Synergies with DGNB system applications

- **DGNB INTERIORS:** Some of the results for indicators 1 and 3 can be used in criterion PRO1.6 from the scheme for interiors.
- **DGNB RENOVATED BUILDINGS:** Indicators 1 to 3 correspond to the content of criterion PRO1.6 from the scheme for renovated buildings.
- **DGNB DISTRICTS:** There are similarities with criterion PRO3.5 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Architectural competitions are an excellent way of ensuring that a high-quality project is delivered, especially when there is particular emphasis on taking an integrative, interdisciplinary approach by means of corresponding participation conditions for integral planning teams and on the composition of the panel of judges.

II. Additional explanation

Competitions stimulate creativity and innovation and allow alternative solutions to be developed; they are also an effective way of optimising quality and economic viability. To ensure that the building work reflects the quality of the winning design, the competing team should be part of the overall planning team and should work with them on as many service phases of the project planning and implementation process as possible. The competition planning procedure should be held in accordance with internationally accepted regulations such as UIA regulations or/and UNESCO recommendations. Additionally the local regulations for design competitions can be included.

III. Method

The evaluation is carried out based on the following indicators:

Indicator 1: Exploration of different design variants or planning competition
Indicator 1.1: Prior exploration of different design variants
Buildings for which a competition has not been held, for which an architecture prize has not been awarded or that have not received recognition by an independent committee (e.g. designs by the in-house planning departments of building authorities) can obtain points in the evaluation if at least two design variants have been planned and documented at the preliminary planning stage. The scope of the design variants should comply with the specifications in the required documentation for this indicator.

Indicator 1.2: Planning competition
The objective of the evaluation is to determine the scope and quality of the planning competitions that have been held.

Indicator 1.2.1: Scope and quality of the planning competition
Has a planning competition or a comparable competition, including its evaluation and selection of entries, been held successfully in accordance with UIA Guidance?

(1) Comparable competition types such as European Union competitions. Comparative planning and exploring different design variants within a single plan cannot be used in place of planning competitions
(2) Credit can also be given to planning competitions for industrial and retail buildings with a scope that extends to only certain areas of planning, such as the façade design.

If a planning competition with a special focus on sustainable buildings is prepared and held, and a qualified panel of judges and experts (from different disciplines) with experience in the field of sustainable buildings is used for this competition, this will be reflected positively in the evaluation.
The task description should set out the essential requirements with regard to sustainable building based on selected criteria from the DGNB certification system and should consist of documentation elaborating the fulfilment of

requirements. These documents should be verified in the competition entry. As an example, the "*Systematik für Nachhaltigkeitsanforderungen in Planungswettbewerben – SNAP Empfehlungen*" (available only in German language) or a comparable system can be used.

Indicator 1.2.2: Type of competition
What type of competition was chosen? Competition types with only minimal restrictions are preferred.

Indicator 1.2.3: Implementation of a winning design
Does the scope and quality of the building that is built reflect the winning entry and is the architecture firm, who won the competition, commissioned?

Indicator 1.2.4: Commissioning of the planning team
Competitions are generally run by interdisciplinary planning teams, who are responsible for the overall project quality. To ensure that the right conditions are created for collaboration in these competitions, commissioning this specialist design team is encouraged and is reflected positively in the evaluation.

Indicator 2: Recommendations by an independent design committee
The participation of DGNB Commission of Design Quality or the presentation of the project in front of a design committee of the municipalities or chambers of architects (or equivalent) will be reflected positively in the evaluation of this indicator. As part of the project presentation in front of a design committee, the project team and the building owner are given recommendations on how to increase the value of the building in terms of design and "*Baukultur*". If these recommendations are implemented, this can be credited in the evaluation. The recommendations and how they are implemented in practice must be documented, and this documentation must be submitted.

Explanation: The design recommendation by DGNB is always held in DGNB Headquarters in Stuttgart, Germany. The design recommendation is the result from collaborative work with German Federal Chamber of Architects (*Bundesarchitektenkammer*), and draws on the expertise from Association of German Architects (*Bund Deutscher Architekten*). The members of the commission are always appointed by the three institutions and for the duration of three years. The commission team always meets up as a three-person crew and may consist of architects, urban planners or, depending on specific projects, representatives from universities or similar institutions.

Alternatively:

Indicator 3: Award in the form of an architecture prize
The recognition or the awarding of the completed project in the form of an architecture prize or “DGNB Diamond” Award will be reflected positively in the evaluation.

Please note: “DGNB Diamond” Award or equivalent form of recognition in terms of good design and "Baukultur" cannot be obtained before DGNB Gold Certificate or DGNB Platinum Certificate is awarded. The recommendation given by DGNB Commission of Design Quality with regard to an award is sufficient for the project to be recognised within the framework of DGNB certification. Whether or not it is possible to start the evaluation process for “DGNB Diamond” Award in the respective country must be confirmed by DGNB.

APPENDIX B – DOCUMENTATION

I. Required documentation

The following list depicts the possible forms of documentation. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1.1: Prior exploration of different design variants

- Different design variants for the whole building are explored by the appointed planning firm
- The variants considered are presented
- At least two different variants for each of three of the following areas should be explored and presented:
  - Building infrastructure (situation of entrance)
  - Views (issues relating to the façade)
  - Cubic content
  - Materials
  - Urban design variants
  - Floor plan variants

Indicator 1.2: Planning competition
Indicator 1.2.1: Scope and quality of the planning competition
Planning competition held:

- Excerpt from the public offer of a reward of the planning competition that was held, specifying the competition guidelines, the competition criteria, the schedule of accommodation and a list of the members of the panel of judges.
- Additional documentation such as meeting minutes can also be submitted for the purpose of clarification.

Indicator 1.2.2: Type of competition

- Information about the type of competition held in the form of excerpts from the public offer of a reward, the preliminary inspection report or the report by the panel of judges.

Indicator 1.2.3: Implementation of a winning design

- Documentation on the implementation of the winning design and the commissioning of the prize winner, featuring a list of the relevant service phases by submitting excerpts of signed agreements.
- Any documentation of or comparison between the winning design and photos of the building as it is actually built.
- Publication of the design in specialist magazines and the like.

1.2.4: Commissioning of the planning team

- Documentation of the commissioning of the prize winner's specialist design team by submitting excerpts of the signed agreements.

Indicator 2: Recommendations by an independent design committee

- Minutes of the design committee meeting, including information on the composition of the independent committee
- Comparison of the planning status before and after the design committee meeting, with information about recommendations that are implemented
- Statements: If certain recommendations have not been implemented, this must be explained by the building owner or architect through a statement.

Indicator 3: Award in the form of an architecture prize

- Documentation of the award in terms of the architecture prize or other recognition, with information about the panel of judges and the reasoning for award
- Additional information published about the award
- List of members on the panel of expert judges, with information about their profession and qualification
- Recommendation by DGNB Commission of Design Quality for “DGNB Diamond” Award or a recognition for good architectural design

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
605	General: scheme “assembly buildings” has been added	16.09.2021
606,610	Evaluation and Method: a design recommendation by the DGNB commission has been removed	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org
- *Systematik für Nachhaltigkeitsanforderungen in Planungswettbewerben*: https://www.nachhaltigesbauen.de/fileadmin/pdf/veroeffentlichungen/SNAP_1_Empfehlungen-korr.pdf

PRO2.1

Construction site / construction process

Objective

Our objective is to minimise negative impacts on the local environment during the construction phase. In order to achieve this, the contractors at the construction sites must be made aware of the relevant environmental issues and receive training in this area.

Benefits

Trained staff generally applies its knowledge to the everyday work and are also able to use this knowledge in the future to reduce the environmental impact of construction sites for other projects.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Moderate	3.4	Reduce mortality from non-communicable diseases and promote mental health	3.2.a/b	Air pollution
	3.9	Reduce illnesses and death from hazardous chemicals and pollution		
	12.5	Sustainably reduce waste generation		
Low	6.3	Improvement of water quality, wastewater treatment and safe reuse		
	12.4	Responsible management of chemicals and waste		

Outlook

There are currently no plans to make any of the requirements in this criterion significantly stricter in the next few years. Ideally, this criterion will no longer be needed in a few years' time, when the addressed topics have become standard practice.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Production, Assembly buildings	1.6%	3

EVALUATION

In order to minimise the impact on the local environment, four indicators are used to evaluate the extent to which measures reduce noise (indicator 1), dust (indicator 2), negative impacts on soil and groundwater (indicator 3), and waste (indicator 4) have been implemented on the construction site and how much training the contractors at construction site have received in this area. Measures to reduce noise and dust pollution that fall outside of the scope of the proposed topics can be credited as an alternative under the relevant innovation areas. Innovative concepts, construction methods and technologies that reduce the amount of waste generated can be credited with an additional 10 points by means of the "Waste prevention on the construction site" circular economy bonus. In this criterion, a maximum of 100 points can be achieved in total without bonus points, or a maximum of 110 points including bonus points.

NO.	INDICATOR	POINTS
1	**Low-noise construction site**	
1.1	**Low-noise construction site concept** A concept that is specific to the relevant trades was formulated	5
1.2	**Training for the contractors** Training provided to the relevant trades	10
1.3	**Reviewing the implemented work** Review/documentation provided for the work implemented	10
Re 1	**INNOVATION AREA** Explanation: Alternative innovative/new concepts, processes and technologies for significantly reducing noise pollution which construction site workers and the environment are exposed to can also be credited.	**As in 1**
2	**Low-dust construction site**	
2.1	**Low-dust construction site concept** A concept that is specific to the relevant trades was formulated	5
2.2	**Training for the contractors** Training provided to the relevant trades	10
2.3	**Reviewing the implemented work** Review/documentation provided for the work implemented	10
Re 2	**INNOVATION AREA** Explanation: Alternative innovative/new concepts, processes and technologies for significantly reducing dust pollution which construction site workers and the environment are exposed to can also be credited.	**As in 2**

3	**Soil and groundwater protection on the construction site**	
3.1	**Soil and groundwater protection concept** Soil protection concept was formulated for the relevant construction site installations such as containers and construction machinery; concept is integrated accordingly into tender specifications	5
3.2	**Training for the contractors** Training provided to the relevant trades	10
3.3	**Reviewing the implemented work** Review/documentation provided for the work implemented	10
4	**Low-waste construction site**	
4.1	**Low-waste construction site concept** A concept was formulated to prevent waste on the construction site	5
4.2	**Training for the contractors** Training for those involved in construction process focussing on the issues of waste prevention and sorting or commissioning waste logistics specialists	10
4.3	**Reviewing the implemented work** Review/documentation provided for the work implemented	10
4.4	**CIRCULAR ECONOMY BONUS – WASTE PREVENTION ON THE CONSTRUCTION SITE** Explanation: Innovative/new concepts, construction methods or technologies that significantly reduce the amount of waste generated are used on the construction site.	+10

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

–

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT

Synergies with DGNB system applications

- **DGNB RENOVATED BUILDINGS:** Some of the aspects of indicators 1, 2, 3 and 4 can be used in criterion PRO2.1 from the scheme for renovated buildings.
- **DGNB DISTRICTS:** There are similarities with criterion PRO1.8 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Building sites and building processes pollute the local environment through noise, dust, and dirt. General efforts to minimise the impact of dust and noise on the local environment will promote good health and foster greater acceptance from everyone directly affected by the works of the construction site.

This, in addition to eliminating waste and closing material cycles, plays a key role in achieving sustainability and in climate protection. It is therefore important to put the right conditions in place to facilitate effective recycling of construction waste and, in particular, to minimise mixed waste.

II. Additional explanation

Indicator 1: Low-noise construction site
Noise has a considerable impact on the quality of life of humans and animals. Permanent noise exposure can lead to overstimulation of the nervous system which is harmful to health. In areas with high building density and high infrastructure standard, building noise is the most significant source of noise after traffic. According to the legal requirements (in Germany: Federal Control of Pollution Act) each building site should be planned, set up and operated in such a way that the building noise does not exceed the general noise level or is reduced through suitable measures.

Indicator 2: Low-dust construction site
"Dust" is defined as solid suspended particles in air, or gases, or their residue. As a rule, dust develops on building sites through the processing of building materials from a wide range of activities. Depending on the material composition and grain size of the dust, serious (consequential) damage may be caused to health.
Measures to prevent dust therefore protect all people who work in a construction site or live adjacent to it. In addition, the environment must also be safeguarded from substance related damage.

Indicator 3: Soil and groundwater protection on the construction site
Soil and groundwater must be protected against harmful substances and mechanical influences.
Under normal working conditions, chemical effects resulting from work processes can lead to gaseous, liquid, and solid substances ending up in the soil. Therefore, the aim should be to return the soil to its original state following the construction work, or to deal with the accumulated pollution where necessary. When doing so, care should be taken to protect developed soil layers.

Indicator 4: Low-waste construction site
If buildings are erected, renovated, converted or demolished then building rubble, excavated material, residual material, packaging, and wood waste will accumulate. The locally specified waste regulations requirements (in Germany) state how construction waste is to be handled: It should be prevented or recycled. Unavoidable waste and waste which cannot be recycled must be dealt with in an environmentally friendly way.
The objective is to separate the waste materials on the construction site – a necessary step for recycling that effectively recovers the materials' value. Separation eliminates mixed waste, making it the most commercially viable and environmentally responsible – that is to say, the most sustainable – solution for unavoidable waste materials.

III. Method

Indicator 1: Low-noise construction site
A noise prevention concept must be developed for and implemented at the construction site. The noise prevention concept should incorporate the use of low-noise machines approved by appropriate eco-labels (e.g. in accordance with the Blue Angel requirements RAL-UZ 53) or low-noise construction techniques. A schedule for works involving excessive noise should also be outlined and taken into consideration during protected periods. The contractor should be educated on the noise prevention concept, and its implementation has to be checked.

Indicator 2: Low-dust construction site
Machines and appliances are provided with an effective suction system. Dust must be captured at the point of development as much as possible and disposed of without any danger. The scattering of dust onto unpolluted work areas is prevented as much as technically possible. Dust deposition must be avoided. Damp or wet processes, or suction processes could be carried out for rectification.
Installations to separate and capture dust are in line with the current state of technology. These installations are regularly checked and subjected to maintenance work. The legal requirements are met through these measures.
The contractor should be educated on the dust prevention concept, and its implementation has to be checked.

Indicator 3: Soil and groundwater protection on the construction site
It is particularly important to protect natural, undisturbed soil layers. Valuable soil or biotopes on the construction site can be protected, for example, through fenced-off protection areas that people cannot access. Valuable topsoil layers can be shifted and the piled-up soil (excavated soil) can be used for planting during the construction phase.
The contractor should be educated on the soil and groundwater protection concept, and its implementation has to be checked.

To protect the soil and groundwater against the ingress of contaminants, substances that pollute soil, water and the environment must be avoided. To this end, the designation "environmental hazard" described in chemical regulations (EC-Regulation No 1272/2008, which replaces the obsolete EU Directive 67/548/EEC) can be used as an exclusion criterion for tender documents.

In accordance with chemical regulations, materials that are hazardous to the environment must be identified by the GHS-symbol (GHS09 – Environmental hazard) shown below on the container and the safety data sheet as a minimum.

Construction materials that are hazardous to the environment should be avoided. This applies in particular to areas of the construction site at the edges of water bodies and in water protection zones.

For hazardous but unavoidable construction materials, such as uncured epoxy resins, measures must be taken at the construction site to ensure that these substances do not pollute the environment.

Indicator 4: Low-waste construction site

In addition to complying with the statutory minimum requirements of the local waste regulations, a concept must be developed to eliminate construction site waste.

The contractor is trained in waste separation. The correct separation of materials and the use of the collection points are checked.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

In general, tender documents and other types of documentation must address the following measures:

- Noise protection measures
- Dust emission protection measures
- Soil and groundwater protection measures

In addition, site facilities plans which provide information regarding waste disposal concepts, noise control measures and soil and ground water protection measures must be verified.

Indicator 1: Low-noise construction site

- Tender documents
- Detailed noise prevention concept
- Measurement logs of the noise level during the construction phase
- Photo documentation
- Site inspection reports
- List of construction machines used plus documentation of the noise level in relation to the requirements in accordance with the RAL-UZ-53 or comparable labels (see also the Directive 2000/14/EG)
- Documentation of training/instruction provided to the relevant construction site workers

Indicator 2: Low-dust construction site

- Tender documents
- Site inspection reports
- List of low-dust construction machinery and equipment used
- Documentation of training/instruction provided to the relevant construction site workers

Indicator 3: Soil and groundwater protection on the construction site

- Tender documents
- Soil protection concept for protecting natural, undisturbed soil layers
- Construction site facility plans, particularly regarding paths, roads, entrances and the like
- Site inspection reports
- Requirements regarding handling of construction chemicals that are hazardous to soil and water
- Photo documentation showing how substances that are hazardous to the environment are stored
- Documentation of training/instruction provided to the relevant construction site workers

Indicator 4: Low-waste construction site

- Tender documents
- Construction site facility plans
- Detailed waste disposal concept
- Site inspection reports
- Photo documentation
- Documentation of training/instruction provided to the relevant construction site workers

  or alternatively

- Contract with a waste specialist
- Declaration/explanation by the waste specialist

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
615	General: scheme “assembly buildings” has been added	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

Indicator 1: Low noise construction site

- RAL-ZU 53. Basis for ecolabel criteria. Low noise construction machines. RAL and Federal Environmental Agency. April 2011
- Blue Angel - The German Ecolabel - RAL-UZ-53:
  - Low Noise Construction Machinery https://www.blauer-engel.de/en/products/business-municipality/baumaschinen
  - Basic Award Criteria, Edition February 2015 https://produktinfo.blauer-engel.de/uploads/criteriafile/en/DE-UZ%2053-201502-en%20Criteria.pdf

https://www.blauer-engel.de/en/node/823

- 2000/14/EC. Directive concerning sound emissions which are harmful to the environment for devices and machines intended for use outside (Outdoor directive). European Parliament and the Council of 8 May 2000. May 2000

Indicator 3: Soil and groundwater protection on the construction site

- Regulation (EC) No 1272/2008 of the European Parliament and of the Council. December 2008: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008R1272&from=en
- Translation and explanation of R-phrases: http://schoolscout24.de/cgi-bin/keminaco/rspinput.cgi
- Principles for the assessment of building products on the soil and ground water draft. Centre of Competence in Civil Engineering - DIBt -, Berlin. May 2008 (available in English)
- EN ISO 14001. Environmental management systems - requirements with instructions on application. Berlin: Beuth publisher, November 2009

Indicator 4: Low waste construction site

- State waste regulations
- Respective regional by-laws

PRO2.2

Quality assurance of the construction

Objective

Our objective is to ensure that the requirements with regard to sustainability aspects from the planning stage are appropriately implemented through informative quality assurance processes during the construction phase and, based on this, provide documentation that these requirements have actually been fulfilled.

Benefits

If the quality of the building can be verified by means of appropriate investigations, this plays a key role in ensuring that the building can be used sustainably and for a long time to come. This provides the building owner with informative documentation on the quality of the commissioned work, and the user can be informed appropriately.

Contribution to overriding sustainability goals

No direct contribution to the Sustainable Development Goals (SDGs) of the United Nations (UN) and to the German Sustainability Strategy.

Outlook

Quality as one of the basic requirements for sustainable buildings will continue to be one of the central tenets of this system in this form. There are currently no plans to make any of the requirements in this criterion significantly stricter in the next few years.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Production, Assembly buildings	1.6%	3

EVALUATION

Indicator 1 is used to give credit where quality assurance processes have been established in the building in the form of an overarching plan. Indicator 2 provides incentives to implement quality assurance processes, such as measurements for various sustainability issues. Measures that fall outside of the scope of the proposed topics can be credited as an alternative under the innovation area indicator. Indicator 3 gives credit for sites which implement strict quality assurance with regard to relevant characteristics of the construction products used. Indicator 4 is used to give credit for measures to prevent or reduce the risk of mould growing. A maximum of 60 points can be obtained for indicators 2.1 to 2.8 – that is to say, it is not necessary to carry out all the measurements in order to obtain the maximum possible number of evaluation points, but rather only those measurements that are relevant to the project. In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**Quality assurance planning**	
1.1	**Quality assurance plan** A quality assurance plan has been drawn up for the completed building, focussing on relevant measurements and specifying the people responsible for the tasks	**10**
2	**Quality control measurements**	
2.1	**Implementation of quality control measurements**	**Max. 60**
2.1.1	Differential pressure has been measured (using blower door test) before the implementation of the fitting work (EN ISO 9972 or DIN EN 13829 or equiv.)	+20
2.1.2	Thermal imaging measurement has been carried out for the building (EN 13187 or ISO 6781 or equiv.)	+10
2.1.3	Reverberation period has been measured for relevant, representative building components	+10
2.1.4	Sound reduction index (airborne sound insulation) pertaining to the attenuation of external noise ingress (e.g. by means of the façade) has been determined	+10
2.1.5	Sound reduction index (airborne sound insulation) pertaining to the attenuation of noise in the interior (e.g. by means of meeting-room walls) has been determined	+10
2.1.6	Measurements have been taken to determine the footfall noise level from ceilings	+10
2.1.7	Other measurements that are relevant to the building (e.g. immissions control measurement, smoke extraction tests, moisture measurement prior to laying floor coverings in order to prevent moisture damage, etc.) have been taken – and the associated zero-defect declaration has been submitted	+10

Re 2	**INNOVATION AREA** Explanation: Additional or alternative measurements or other quality assurance measures can be credited here if they provide documentation on the high quality of the building or its building components, and these are not required by law or by the authorities and are not common practice.	**As in 2**
3	**Quality assurance for construction products**	
3.1	**Quality assurance for the construction products used** Site is managed based on the requirements lists drawn up for the construction products that are to be used based on criteria ENV1.2, ENV1.3 and SOC1.2 and A continuous comparison between target material use and actual material used (as required) is conducted and site management has produced documentation to demonstrate this in the form of site inspection reports	**20**
4	**Mould prevention**	
4.1	**Mould prevention** A ventilation programme tailored for the building has been drawn up and implemented in order to ensure that the building components are sufficiently dry	**10**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The number of sustainability aspects for which quality assurance measurements have been taken is a good key performance indicator (KPI) to report. The results of moisture measurement or mould prevention measures can be used for reporting purposes in accordance with "Level(s) – Common EU framework of core environmental indicators" [T&D_02].

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Number of sustainability aspects for which quality assurance measurements have been taken	[number]
KPI 2	Mould prevention measures implemented; corresponds to Level(s) indicator 4.1 Mould inspection [T&D_02]	[Yes]
KPI 3	Checking and testing the quality of construction and installation corresponds to Level(s) Indicator 1.1 - L3.2. [T&D_02]	[Yes]

Synergies with DGNB system applications

- **DGNB BUILDING IN USE:** The results of the measurements can be used in criterion 9.1 from the scheme for buildings in use as a basis for reporting relevant key performance indicators.
- **DGNB INTERIORS:** The results for indicators 2.3 and 2.5 can be used in criterion SOC1.3 from the scheme for interiors.
- **DGNB DISTRICTS:** Information from this criterion can be used in criterion PRO1.8 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Particularly in light of the increasing complexity of projects and the many different parties involved in planning and, above all, implementing these projects, quality assurance measures are crucial. "Invisible" defects, in particular, which can have significant negative impacts on both the usage and the user of building, can only be detected by taking measurements. These defects must be rectified before the building comes into use.
Furthermore, the planned energy performance can only be achieved if the building envelope is of the appropriate imperviousness. This must also be measured and verified. This kind of measurement-based quality assurance must be planned early on and the associated responsibilities must be defined.

II. Additional explanation

In practice, one problem that is often encountered is that, despite high standards being applied, the work that is carried out still exhibits certain defects. This is why it is advisable to conduct comprehensive quality controls on the building.
Measuring for quality control purposes plays a key role in allowing the target values set at the planning stage to be verified to establish whether they have been achieved, as well as allow this to be documented.

III. Method

Indicator 1: Quality assurance planning

- A quality assurance plan must be drawn up for the completed building, focusing on relevant measurements and on specifying the people responsible for the tasks

Indicator 2: Quality control measurements

- Measurements must be taken and the results evaluated and compared with the requirements by suitably qualified test bodies or experts
- The scope of the measurements taken should be proportional to the size of the building and should adequately reflect the objective of verifying the building's quality.

Indicator 3: Quality assurance for construction products

- Site management must be instructed based on the requirements lists drawn up for the construction products that are to be used based on the criteria ENV1.2, ENV1.3 and SOC2.1
- A continuous comparison between target material use and actual material used (as required) must be conducted and the site management must produce documentation in the form of site inspection reports to verify this

Indicator 4: Mould prevention

- A ventilation programme tailored to the building situation has been drawn up and implemented in order to ensure that the building components are sufficiently dry

APPENDIX B – DOCUMENTATION

I. Required documentation

The following list depicts the possible forms of documentation. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1: Quality assurance planning

- The quality assurance plan must be submitted – including a schedule for the measurements and a definition of the responsibilities

Indicator 2: Quality control measurements

- Each indicator must be submitted using DGNB´s template for confirmation from the test body or expert that the measurements have been taken and that the relevant requirements have been fulfilled. Improvements or repair work may be necessary in order to fulfil the requirements; the effectiveness of this work must then be verified by means of corresponding measurements. There is no need to submit measurement results, measurement logs, any intermediate measurements, etc. to the DGNB certification body

Indicator 3: Quality assurance for the construction products used

- Documentation must be submitted to demonstrate that the site management has been instructed in how to use and implement the requirements lists that have been drawn up for the construction products that are to be used
- Documentation must be submitted to demonstrate that the site management has conducted continuous comparisons between target material used and actual material used with the requirements lists, along with documentation of the results by the site management in the form of site inspection reports

Indicator 4: Mould prevention

- Documentation must be submitted to demonstrate that a ventilation programme tailored to the context of the building has been implemented to ensure that the relevant building components are sufficiently dry

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
626	General: scheme “assembly buildings” has been added	16.09.2021
627	Indicator 2: Reference standards for checking and testing completed	16.09.2021
629	Sustainability reporting: KPI 3 on EU taxonomy compliance has been added	16.09.2021

II. Literature

- ISO 9972:2015, Thermal performance of buildings — Determination of air permeability of buildings — Fan pressurization method;
- DIN EN 13829:2001-02, Thermal performance of buildings - Determination of air permeability of buildings;
- EN 13187:1999, Thermal performance of buildings. Qualitative detection of thermal irregularities in building envelopes. Infrared method;
- ISO 6781-3:2015, Performance of buildings — Detection of heat, air and moisture irregularities in buildings by infrared methods

PRO2.3

Systematic commissioning

Objective

Our objective is to promptly hand over the completed building and ensure its systematic operation where all features/attributes work as initially designed.

Benefits

Systematic commissioning ensures that the planned features/attributes of the building are implemented. This minimises risks and is a relevant component for the efficient use of energy sources.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Low	7.3	Double the improvement in energy efficiency	7.1.a/b	Resource conservation
	12.2	Sustainable management and use of natural resources		

Outlook

There are currently no plans to make any of the requirements in this criterion significantly stricter in the next few years. Ideally, this criterion will no longer be needed in a few years' time, when the addressed topics have become standard practice.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Production, Assembly buildings	1.6%	3

EVALUATION

Indicators 1 to 5 evaluate the extent to which systematic commissioning of the completed building has been prepared and documented. Training provided for the operator, including the handover of an operational concept for continuous monitoring, is evaluated in indicator 6. Indicator 7 awards additional points for readjustment after an initial operating phase. This evaluation takes into account at least the following technical components: heating system, ventilation, room air conditioning, cooling technology, building automation, lighting, hot water supply, façade shutters. In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**Monitoring concept**	
1.1	**Creation of a monitoring concept** Suitable monitoring concept is created for recording energy and water consumption	**15**
2	**Commissioning concept**	
2.1	**Creation of a commissioning concept for scheduling** Commissioning concept including scheduling is created	**10**
3	**Preliminary function test**	
3.1	**Performance of a preliminary function test** Preliminary function test of the components is performed and results are documented	**10**
4	**Function test and training**	
4.1	**Performance and documentation of a function test and training for the operator** Function test is performed, its results are documented and training is provided for the operator	**15**
5	**Final report on commissioning**	
5.1	**Creation of a detailed final report** A detailed final report for commissioning is created	**20**
6	**Integral operating concept and systematic commissioning**	
6.1	**Creation and handover of an integral operating concept** Creation and handover of an integral operating concept is done as part of a process for continuous monitoring and regulating, and training is provided for the operators	**20**

7	**Commissioning management**	
7.1	**Readjustment of the system following initial operating phase** Commissioning of a specialist planner or a(n) (independent) third party for continued regulation is done, and for the first time, approximately 10–14 months following completion	**10**

Re 3–5	**INNOVATION AREA** Explanation: methods that provide equivalent results in the preliminary tests, function tests, training and reports can be permitted here as additions or as alternatives.	**As in 3–5**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

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NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT

Synergies with DGNB system applications

- **DGNB BUILDING IN USE:** The results of indicator 1 can to some extent be used in criterion ENV9.1 from the scheme for buildings in use.
- **DGNB INTERIORS:** The results of indicator 1 can to some extent be used in criterion PRO8.1, indicator 1.2 from the scheme for interiors.
- **DGNB RENOVATED BUILDINGS:** The results of the indicators can to some extent be used in criterion PRO2.3.
- **DGNB DISTRICTS:** There are synergies with the criteria PRO1.8 and PRO3.5 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

In a well-planned commissioning the individual components of the building services system are coordinated and adjusted following the approval. Within the framework of operational optimisation the system should be readjusted once again after an initial running time of 10 to 14 months.
The well-planned commissioning requires a concept for adjustment and readjustment, and this must be secured contractually. It must be carried out by a specialist company and it should be recorded. In addition to the verification of the adjustment, the documentation must also contain information on significant pre-settings of the system so that improper changes implemented by the user can be reversed.

II. Additional explanation

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III. Method

Indicator 1: Monitoring concept
An appropriate monitoring concept has been implemented for the building, which at minimum enables all energy and water consumption to be regularly (on a monthly basis) and comprehensively recorded.

Indicator 2: Commissioning concept
An appropriate commissioning concept has been created for the building. It describes all essential elements of the commissioning process, including scheduling.

Indicator 3: Preliminary function test
All essential technical components have demonstrably undergone a preliminary function test. Appropriate documentation of this is available.

Indicator 4: Function test and training
All essential technical components have demonstrably undergone a function test. Appropriate documentation is available, enabling future operators to understand the test results. The operator has been appropriately briefed.

Indicator 5: Final report on commissioning
A complete final report on the commissioning of the building is available.

Indicator 6: Integral operating concept and systematic commissioning
An integral operating concept has been transformed into a process of continuous monitoring and regulating. The operator has been appropriately briefed regarding the integral operating concept.

Indicator 7: Commissioning management
The contractually agreed service descriptions regarding commissioning management form the basis for the review of the systematic commissioning. Commissioning management requires comprehensive service descriptions for a structured approach, documentation of the services and documentation of acceptance, commissioning and optimisation during building operation.

Service description for commissioning management:

1. General services
The services required for commissioning management are highly comprehensive and begin as early as in the planning phase. These services relate to a structured approach, performance documentation and documentation of acceptance, commissioning and optimisation during building operation.
Commissioning management must be carried out by a (where applicable, independent) body (commissioning authority, e.g. an engineering office not involved in the planning and implementation of the project), which can consist of one or more persons. For the objectives of this indicator, the (independent) body must be involved in the project with the exception of the planning and implementation tasks.
The professional expertise of the (independent) body must be documented via definitive references (at least two projects) provided by a project manager/company regarding provision of comparable services.

In accordance with the described requirements and conditions, the (independent) body provides the services described below.

2. Service phase 3 “Developed design” [T&D_01]
Establishment of the organisation:

- Integration into the complete project team including induction
- Coordination meetings with the client
- Organisation of the commissioning activities
- Setting up the commissioning team

Creation of a commissioning plan:

- Objectives of commissioning
- Tasks and activities in the commissioning process
- Scope of installations and systems in the commissioning process
- Responsibilities within the commissioning team
- Planning basis:
  - Comfort parameters
  - Technical parameters
  - Boundary conditions
- Deadlines and processes

Integration of the specifications into the commissioning plan (see criterion PRO 1.1 Comprehensive project brief) – Service phases 1 + 2: “Strategic definition” + “Concept design” [T&D_01]:
Summary of the building owner's requirements and project objectives on the basis of the previous specifications and

integration into the process:

- Building owner and user requirements
- Cross-system project objectives
- Flexibility, quality, costs
- Environment and sustainability
- Energy objectives for compliance
- Comfort and technical boundary conditions
- System description of the technical installations
- Concept for the operation of building
- Elaboration on the future use

Each describing clear objectives and measurable success criteria (e.g. temperatures, consumption, etc.).

3. Service phases 5 + 6: "Technical design" + "Tender preparations" [T&D_01]
Design review in the detailed design phase:
Support for the detailed design process with regard to relevant issues concerning commissioning, such as:

- Definition of system requirements resulting from commissioning
- Processes appropriate for commissioning in planning and implementation
- Requirements regarding measuring equipment with regard to documentation for commissioning and later building operation (recommissioning)
- Accessibility for commissioning

Validity check and instructions for expanding the overall operating concept with regard to optimised operation of the installations and systems relevant to commissioning, including instructions for creating a supplementary operational description with regard to the aspects of performance measurements, functional documentation and optimised system operation during the operating phase.

Invitation to tender for the commissioning:
Definition of the requirements for commissioning and briefing regarding the relevant service texts in the tender documents.

4. Service phases 8 + 9: "Construction" + "Completion and documentation" [T&D_01]
Preliminary function test (see indicator 3):
Creation of checklists and test reports as a guideline to aid the commissioning and acceptance process for the company contracted to provide the services.

- The checklists and test reports contain the required results after commissioning has been carried out by the contracted companies, as well as, for example, performance documentation and measured values for factory acceptance of the major components (e.g. cooling system, lighting, etc.).
- The checklists must be completed by the contracted company and must be checked by the commissioning management to ensure completeness and plausibility.
- Ensuring that all required tests have been documented via reports and checklists as a requirement for the subsequent function and performance tests.

Function test (see indicator 4):

- Creation of a process concept for the function and performance tests to be carried out on the various systems under various operating conditions and dependencies (such as full load operation, emergency operation, etc.).
- Coordination and monitoring of the function tests in close cooperation with the contracted companies and specialist planners.
- Recording of the results
- As part of the preparations for the function and performance tests, coordination meetings with the contracted companies and designers must be carried out at an early stage and documented via results logs.

Documentation (see indicator 5):

- Creation of a final report once the entire commissioning and acceptance process has been completed, including a summary of the tests and work processes carried out, documentation of the objectives and a list of outstanding issues that need to be dealt with at the start of the building operating phase.

5. Building use and operating phase
Readjustment (recommissioning):

- Creation of a concept in cooperation with the building owner and facility manager for reviewing and documenting the system target values in the period of 10–14 months after building occupancy.
- List of defects and remaining tasks established during test operation as a basis for corrective measures by the contracted companies.

Collaboration on optimisation measures during the initial building operating phase, following evaluation of the measurement results, in order to achieve the objectives in accordance with the requirements resulting from commissioning. List of required measures and recommendations for optimal system operation in the use phase of the building is established.

APPENDIX B – DOCUMENTATION

I. Required documentation

The following list depicts the possible forms of documentation. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

- Commissioning plan including measurable objectives with regard to consumption, temperatures, etc., and a formulated concept for complete documentation of the regulating and readjustment processes
- Excerpts from the commissioning reports and contract documents with an independent body for carrying out commissioning management
- Handover certificates or process concept for completed preliminary function tests
- Handover certificates or process concept for completed function tests
- List of completed function tests and associated reports (for all systems such as heating systems, ventilation, façade shutters, etc.) with results
- Formulated concept for transforming commissioning into a process of continuous monitoring and optimisation
- Extract of the contract regarding optimisation of the building technology within the first 14 months

Unlike the function test carried out solely for the acceptance process, the commissioning management must be carried out by an external third party. The company (independent third party) contracted to carry out the tests must not:

- Be one of the companies involved in construction of the building technology systems (contracted companies) or
- Be one of the companies contracted to carry out commissioning, regulating or operational optimisation (architect, building technology designer).

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
635	General: scheme “assembly buildings” has been added	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

PRO2.4

User communication

Objective

Our objective is to actively inform the building's users with regard to the building's sustainability in order to motivate them to contribute to the building's sustainability and, in particular, motivate them to act in a way that ultimately contributes to their own well-being.

Benefits

If adequate efforts are made to show users how they can help make the building more sustainable through their own behaviour and actions, it can be assumed that the desired effects are achieved. Furthermore, effective communication increases customer retention and customer satisfaction.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)	CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY
Low	4.7 Education for sustainable development and global citizenship 12.8 Promote universal understanding of sustainable lifestyles	

Outlook

Ideally, this criterion will no longer be needed in a few years' time, when the addressed topics have become standard practice.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Production, Assembly buildings	1.1%	2

EVALUATION

In order to encourage users to play an active role in ensuring the sustainability of the building, this evaluation examines how much information has been provided to them for this purpose. In addition to the provision of a sustainability guide (indicator 1), points will also be awarded for having a sustainability information system installed in the building (indicator 2) and for providing a technical user manual. In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**Sustainability guide**	
1.1	**Provision of a sustainability guide for the user** A sustainability guide has been provided for the user	**35**
2	**Sustainability information system**	
2.1	**Implementation of an information system on the sustainability aspects of the building**	**Max. 30**
	■ A concept has been developed, including implementation planning	+15
	■ An information system on the sustainability of the building has been installed	+30
3	**Technical user manual**	
3.1	**Provision of a technical user manual** A technical user manual has been provided	**35**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Not available

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT

Synergies with DGNB system applications

- **DGNB BUILDING IN USE:** Points awarded for indicators 1 and 2 in this criterion can also be awarded for indicators 2.3 and 2.5 in criterion PRO9.1 from the scheme for building in use.
- **DGNB INTERIORS:** There are synergies with criterion PRO2.4 from the scheme for interiors. The results for the indicators can be used partially in the scheme for new buildings.
- **DGNB RENOVATED BUILDINGS:** Some of the results for the indicators can be used for criterion PRO1.5 of the scheme for renovated buildings.
- **DGNB DISTRICTS:** There are synergies with criterion PRO3.5 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

User cooperation is incredibly important when it comes to ensuring that a building is sustainable. To this end, users must be provided with the necessary information and training.

II. Additional explanation

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III. Method

Indicator 1: Sustainability guide
The building has a sustainability guide with specific recommended courses of action for the building users with regard to ecological, economic and social issues.

The medium of the guide may be chosen by the user themselves (e.g. paper, digital, regular newsletter, etc.). The crucial factor is that all regular users of the building have equal access to the information.

At a minimum, the guide includes information on the subjects of energy and water conservation, waste separation and a healthy indoor climate.

The guide should also include information on other sustainability issues that are not directly related to the building but are nevertheless relevant, such as the safety, security and health of the building's users (e.g. at the workstation/in the workspace, in the hotel) and regarding the users' journey to the building.

Indicator 2: Sustainability information system
The objective is to integrate users into the process of sustainable management by means of attractive, readily available information.

To achieve this, there is an on-site information system or an equivalent concept regarding the sustainability aspects of the building. This should provide information by means of various information media (screens, stickers, posters, noticeboards, labels, etc.) on the objectives, the savings achieved to date in the building, etc.

Indicator 3: Technical user manual
The evaluation will check that a user manual has been produced and provided and that the information and specifications it contains supports the operation of the building. This should be a simple set of user instructions for the building's technical services. The user manual should use simple graphics to explain the technical aspects and should also specify when other technical specialists (FM) should be called in. Unlike a facility management manual, this manual is aimed directly at the building's users. It does not need to be a separate document, but can or should be included with the sustainability guide, for example.

One of the purposes of a user manual is to explain the technical aspects of the building technology and the specific characteristics of individual components. This could be windows or HVAC systems, for example. Additionally, the

user manual provides information on how to use the building sustainably. For instance, there should be information on how the user can reduce their electricity consumption.

Other possible examples:

- Production of a user manual for hotels
  The purpose of this manual is to offer hotel guests recommendations on how they might help make the building more sustainable. The manual contains guidelines regarding water and electricity consumption or the cleaning of rooms and washing of laundry, for example.
- The technical user manual for hotel guests could include the following points:
  - Suggestions on how to reduce consumption
  - How to operate the heating/cooling system
  - How to operate the shades
  - Contact persons for room service, cleaning, laundry, etc.
  - Basic functions of the technical building services
  - Operating hours of the building, journey to the building, underground garage
  - How to operate the intercom system, video, locking system, etc.
  - How to operate the ventilation

- Production and provision of a tenant manual for rental units
  The purpose of this tenant manual is to provide tenants with information on how they might help make the building more sustainable. The tenant manual recommends materials for the fitting work and provides important explanations regarding the building technology, for example.
- The technical user manual for tenants could include the following points:
  - How to operate the heating/cooling system
  - How to operate the shades
  - Contact persons for FM, security, etc.
  - Building opening times, journey to the building, underground garage
  - How to operate the intercom system, video, locking system, etc.
  - How to operate the ventilation
  - How to expand the media networks
  - Fitting, remodelling and conversion options

APPENDIX B – DOCUMENTATION

I. Required documentation

The following list depicts the possible forms of documentation. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

Indicator 1: Sustainability guide

- Confirmation of receipt, ideally by the user/tenant, or alternatively by the building owner, who has made a voluntary commitment to deliver this.

Indicator 2: Sustainability information system

- Confirmation by the auditor that this has been installed or that the concept exists, and that the building owner has made a voluntary commitment to implement the concept or to pass it on.

Indicator 3: Technical user manual

- Confirmation of receipt, ideally by the user/tenant, or alternatively by the building owner, who has made a voluntary commitment to deliver this.

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
646	General: scheme “assembly buildings” has been added	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

PRO2.5

FM-compliant planning

Objective

Our objective is to adequately take into account the requirements of facility management (FM) for later building operation, as early as in the planning phase. This enables optimal operation of the building by users and service providers.

Benefits

An early review of the areas with regard to the requirements resulting from the building operation and operating cost projection enables later operating costs and effort to be significantly reduced by means of simple measures. In addition, the analysis and optimisation of user-related and use-related energy consumption supports the energy efficiency of the entire building and thereby results in lower operating costs.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Moderate	7.3	Doubling the improvement in energy efficiency	7.1.a/b	Resource conservation
	12.2	Use of natural resources		

Outlook

Ideally, this criterion will no longer be needed in a few years' time, when the addressed topics have become standard practice.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production** **Assembly buildings**	**0.5%**	**1**

EVALUATION

The extent to which later optimal operation of the building has already been taken into account in the planning process is evaluated here. In addition to the performance of an FM check for the project (indicator 1) and creation of a detailed operating cost projection (indicator 2), points are also awarded for the creation of a concept for optimisation of user-related and use-related energy consumption (indicator 3). In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**FM check**	
1.1	**Performance of an FM check** Performance of an FM check for the project with regard to accessibility, operational routing and space utilisation issues	**30**
2	**Operating cost projection**	
2.1	**Detailed operating cost projection** Creation of a detailed operating cost projection	**40**
3	**User-related and use-related energy consumption**	
3.1	**Optimisation of user/use-related energy consumption**	**Max. 30**
	■ Optimisation of the user-related and use-related energy consumption	+15
	■ Creation and implementation of a metering concept relating to the facilities that have an impact on energy consumption	+15

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

–

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT

Synergies with DGNB system applications

- **DGNB BUILDING IN USE:** The operating cost projection supports compliance with indicator ECO9.1.4.1 from the scheme for buildings in use.
- **DGNB INTERIORS:** Indicators 1 and 3 can to some extent be used in criterion PRO1.8, indicators 1.3 or 1.4 and 2 from the scheme for interiors.
- **DGNB RENOVATED BUILDINGS:** The results of indicator 3 can be used in indicator PRO1.5.1 from the scheme for renovated buildings.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

To ensure optimal operation of the building, the relevant processes and areas must be taken into account as early as in the planning phase.

II. Additional explanation

–

III. Method

Indicator 1: FM check
Objective: optimisation of planning with regard to sustainable building operation.

Analysis of planning of the building in terms of accessibility, operational routing and space utilisation with regard to the sustainable operation of the building, this includes:

- Detailed examination of the areas relevant for operation (e.g. rubbish disposal rooms, delivery zones, material storage and cleaning supply storage room) with regard to factors such as size, accessibility and layout
- Detailed examination of the surface quality (including floor and wall coverings, lighting, ventilation, water supply, waste water drainage, cooling and heating)
- Detailed examination of façades, floor coverings and building structures with regard to cleaning parameters (e.g. accessibility, area efficiency, cleaning friendliness and occupational safety)
- Evaluation regarding operational processes, organisation and workflows
- Detailed examination of the building technology with regard to operation (e.g. ease of maintenance and accessibility of components relevant for maintenance)
- Ensuring guidance options (possibilities for orientation) are available for users and operators within the building

Indicator 2: Operating cost projection
The objective is the optimisation of planning with regard to cost-effective operation of the building.

To this end, an assessment of the future operating costs based on the operating concept and the user-specific features must be carried out. The following cost types and services must be recorded in the operating cost projection:

Infrastructure services:

- General cleaning
- Glass cleaning
- Facade cleaning
- External cleaning
- Winter road clearance
- Gardening services
- Reception services
- Safety and security

Technical services:

- Operation
- Periodic review
- Inspection and servicing

Energy costs:

- Heat
- Electricity
- Water

Municipal charges:

- Waste water fees
- Street cleaning
- Property tax

Indicator 3: User-related and use-related energy consumption
An appropriate energy saving concept is created for appliances such as lifts, escalators, effect and façade lighting, displays and user equipment. This concept must be taken into account during the planning process in order to identify potential improvements, which are then documented accordingly.

As part of the planning process for the building, a metering concept for recording the user-related or use-related energy consumption must also be created together with the client or a representative of the later building users, and must be established on the basis of the consumers, zones, rental spaces or use spaces to be recorded. The metering concept put in place by the client should enable a verification concept for the FM to optimise the operation with regard to the energy demand.

APPENDIX B – DOCUMENTATION

I. Required documentation

Indicator 1: FM check

- Confirmation by the client/building owner that an FM check has been carried out in accordance with the method described above

Indicator 2: Operating cost projection

- Confirmation by the client/building owner that an operating cost projection has been carried out in accordance with the method described above

Indicator 3: User-related and use-related energy consumption

- Confirmation by the client/building owner that an energy saving concept has been created in accordance with the method described above for the user-related or use-related energy consumption

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
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II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

Site quality

The four criteria of site quality assess the **impact of the project** on its **environment** and vice versa.

SITE1.1	Local environment
SITE1.2	Influence on the district
SITE1.3	Transport access
SITE1.4	Access to amenities

SITE1.1

Local environment

Objective

Our objective is to protect the building and its users from the impact of negative environmental influences and extreme events, and to improve the resilience of buildings to any influences that might be present in the local environment.

Benefits

Natural hazards arise depending on the geographical conditions of the site. The intensity and frequency of these hazards generally cannot be changed and are hard to predict. This makes it all the more important to classify them correctly and to compensate for or to eliminate any potential adverse effects for the people in and around the building. Taking into account the likelihood and potential severity of each of these occurrences at the planning stage reduces the cost of any retrofitting work that might be necessary. Resilient buildings that are tailored to their environment are sustainable in many aspects.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	11.b	Implement policies for inclusion, resource efficiency and disaster risk reduction		
	11.5	Reduce the adverse effects of natural disasters		
	13.1	Strengthen resilience and adaptive capacity to climate related disasters		
Moderate	3.4	Reduce mortality from non-communicable diseases and promote mental health	3.2.a/b	Air pollution
	3.9	Reduce illnesses and death from hazardous chemicals and pollution		

Outlook

While the content of this criterion is tailored to DGNB System application for districts, it also applies within an international context. For applications within Germany, various platforms are being developed, including platforms geared to adapting to climate change. In the medium term, additional results will be incorporated into the criterion.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production** **Assembly buildings**	**1.1%**	**2**

EVALUATION

In total, 14 topics are listed with their relevant indicators to evaluate the environmental risks in the local environment. For the first 11 indicators (indicators 1–11), only the top three most relevant environmental risks are evaluated, classified according to their relevance. Reasons for the individual choices with regard to natural disasters must be given. As a rule, the likelihood of natural disasters occurring is analysed for the purpose of the evaluation. Any auxiliary safety measures implemented on, around or for the building will also be reflected positively in the evaluation. Based on the individual natural disasters, points can be awarded for compensation measures in the surrounding area, up to the maximum number of points permitted for the indicator. Indicators 12, 13 and 14 must be evaluated. In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	MOST AND SECOND MOST RELEVANT X 1.0	THIRD MOST RELEVANT X 0.5
1	**Earthquake**		**Max. 20**
1.1	**Earthquake hazard level**		Max. 20
	Hazard level (earthquake intensity, hazard, 475-year event)		
	■ High (> 8)	0	0
	■ Average (> 5)	5	2.5
	■ Low (< 5)	10	5
	■ Very low (< 1)	20	10
1.2	**Earthquake compensation measures**		Max. 10
1.2.1	There is a regional early warning system for earthquakes and a concept for the district indicating what measures must be taken if a warning is issued.	+5	+2.5
1.2.2	There are dedicated earthquake-proof shelters.	+5	+2.5
1.2.3	A risk analysis has been carried out for the building.	+5	+2.5
1.2.4	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
2	**Volcanic eruption**		**Max. 20**
2.1	**Volcanic eruption hazard level**		Max. 20
	■ Last volcanic eruption was more than 20 years ago or there is a known, acute risk	5	2.5
	■ Last volcanic eruption was more than 50 years ago	10	5
	■ Last volcanic eruption was more than 100 years ago or no volcanic eruption	20	10
2.2	**Volcanic eruption compensation measures**		Max. 10
2.2.1	There is a regional early warning system for volcanic eruptions and a concept is developed for the district, indicating what measures must be taken if a warning is issued.	+5	+2.5

NO.	INDICATOR	MOST AND SECOND MOST RELEVANT X 1.0	THIRD MOST RELEVANT X 0.5
2.2.2	The building is situated on a site that is normally not directly affected adversely by lava and/or debris.	+5	+2.5
2.2.3	A risk analysis has been carried out for the building.	+5	+2.5
2.2.4	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
3	**Avalanches**		**Max. 20**
3.1	**Avalanche hazard level**		Max. 20
	■ Red (Seriously vulnerable area during an avalanche)	0	0
	■ Blue (Rare avalanches; structural measures must be implemented, danger primarily outside)	5	2.5
	■ Yellow (low hazard)	10	5
	■ White (no hazard or negligible hazard)	20	10
3.2	**Avalanche compensation measures (with a direct impact on the building)**		Max. 10
3.2.1	Structural measures to protect against avalanches (e.g. supporting structures, avalanche dams, avalanche galleries or physical protection to stop avalanches)	+5	+2.5
3.2.2	A risk analysis has been carried out for the building.	+5	+2.5
3.2.3	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
4	**Storm**		**Max. 20**
4.1	**Storm hazard level**		Max. 20
	"Winter storm, hazard, 50-year event"		
	■ > 50	0	0
	■ > 25	10	5
	■ < 25	20	10
4.2	**Storm compensation measures (with a direct impact on the building)**		Max. 10
4.2.1	There are no adjacent large open spaces without vegetation or water areas.	+5	+2.5
4.2.2	90% of all the surrounding buildings have no more than four storeys (because the wind load on a facade increases exponentially in relation to its height).	+5	+2.5
4.2.3	A risk analysis has been carried out for the building.	+5	+2.5
4.2.4	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
5	**Floods**		**Max. 20**
5.1	**Flood hazard level**		Max. 20
	■ Very high (flood hazard every 10 to 50 years)	0	0
	■ Medium (flood hazard every 50 to 100 years)	5	2.5
	■ Low (flood hazard less than every 100 years)	10	5
	■ No flood hazard	20	10

NO.	INDICATOR	MOST AND SECOND MOST RELEVANT X 1.0	THIRD MOST RELEVANT X 0.5
5.2	**Flood compensation measures (with a direct impact on the building)**		Max. 10
5.2.1	Flood protection concept based on usage requirements	+5	+2.5
5.2.2	(Temporary) structural measures for flood protection (e.g. dam)	+3	+1.5
5.2.3	Safe distance of the ground floor (> 15 cm) above the water level of a 50-years flood event	+3	+1.5
5.2.4	Enlargement of retention areas within the project area	+3	+1.5
5.2.5	A risk analysis has been carried out for the building.	+5	+2.5
5.2.6	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
6	**Heavy rain**		**Max. 20**
6.1	**Heavy rain hazard level**		Max. 20
	If available, local storm rainfall event catalogue published in a country can be used as reference for the evaluation of this indicator. The evaluation is based on a storm rainfall event (mm of rainfall in 1 hour):		
	■ ≥ 36 mm rain in 1 hour or ≥ 50 mm rain in 6 hours (extreme weather warning); recurs every 10 years	10	5
	■ ≥ 32 mm rain in 1 hour or ≥ 45 mm rain in 6 hours (severe weather warning); recurs every 10 years	15	7.5
	■ ≥ 28 mm rain in 1 hour or ≥ 40 mm rain in 6 hours	20	10
	■ Heavy rain events could not be assigned to hazard maps in the project as these are not available	0	0
6.2	**Heavy rain compensation measures (with a direct impact on the building)**		Max. 10
6.2.1	There is a heavy precipitation expert report containing site-specific statements on precipitation depths and rates based on the duration of the precipitation and the recurrence interval (in years), (e.g. in accordance with a locally available storm rainfall event catalogue).	+5	+2.5
6.2.2	A risk analysis has been carried out for the building.	+5	+2.5
6.2.3	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
7	**Hail**		**Max. 20**
7.1	**Hail hazard level**		Max. 20
	The evaluation is based on the classification of locally available "hail zones" hazard maps (e.g. ESPON risk maps)		
	■ High zone	0	0
	■ Elevated zone	5	2.5
	■ Moderate zone	15	7.5
	■ Low zone	20	10
7.2	**Hail compensation measures**		Max. 10
7.2.1	A risk analysis has been carried out for the building.	+5	+2.5
7.2.2	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5

NO.	INDICATOR	MOST AND SECOND MOST RELEVANT X 1.0	THIRD MOST RELEVANT X 0.5
8	**Landslide/subsidence**		**Max. 20**
8.1	**Landslide/subsidence hazard level**		Max. 20
	■ Hazardous due to the sloping location (incline of over 20 degrees) or location in a mining region and/or due to civil engineering measures (construction of underground railway or similar)	0	0
	■ Not at risk	20	10
8.2	**Landslide/subsidence compensation measures (with a direct impact on the building)**		Max. 10
8.2.1	Analysis and assessments of the soil conditions, involving the relevant geology and mining authorities in collaboration with geologists possessing local knowledge. The following topics must be analysed:		
	■ Research on maps showing tunnels and shafts		
	■ Research on historical tunnels		
	■ Groundwater levels (maximum levels)		
	■ Slope instability		
	■ Cartographic review of the topography, morphology, geological strata and source horizons.		
	■ Check for moisture infiltration and penetration into soils on sloping locations		
	■ Karstification of soils as a risk	+5	+2.5
8.2.2	Structural protection measures, e.g.:		
	■ Installation of drainage systems, either on the surface or deep into the subsoil (e.g. drainage anchors)		
	■ Preventive installations in the vulnerable subsoil – similar to torrent and avalanche shoring systems		
	■ Short-term stabilisation of moving slopes by means of concrete and steel reinforcement (e.g. military anti-tank obstacles)		
	■ Extensive coverage of critical slopes by tarpaulins in order to prevent further penetration of rainwater	+5	+2.5
8.2.3	A risk analysis has been carried out for the building.	+5	+2.5
8.2.4	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
9	**Storm surge/tsunami**		**Max. 20**
9.1	**Storm surge/tsunami hazard level**		Max. 20
	By allocation to the "Tsunami/storm surge" hazard map		
	■ Very high risk	5	2.5
	■ Moderate risk	10	5
	■ Low risk	20	10
9.2	**Storm surge/tsunami compensation measures**		Max. 10
9.2.1	There is a regional early warning system for storm surges/tsunamis and a concept		

	for the surrounding district is developed, indicating what measures must be taken if a warning is issued.	+5	+2.5

NO.	INDICATOR	MOST AND SECOND MOST RELEVANT X 1.0	THIRD MOST RELEVANT X 0.5
9.2.2	The surrounding district is on a site that is normally not directly affected by storm surges/tsunamis (e.g. mountaintop).	+5	+2.5
9.2.3	A risk analysis has been carried out for the building.	+5	+2.5
9.2.4	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
10	**Extreme climates**		**Max. 20**
10.1	**Hazard level for extreme climates/temperatures in accordance with ESPON map or with other comparable hazard maps**		Max. 20
	■ High risk	5	2.5
	■ Moderate risk	10	5
	■ Low risk	20	10
10.2	**Extreme climates compensation measures**		Max. 10
10.2.1	Structural measures to alleviate the effects of extreme climates	+5	+2.5
10.2.2	Organisational measures to alleviate the effects of extreme climates	+5	+2.5
10.2.3	A risk analysis has been carried out for the building.	+5	+2.5
10.2.4	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5
11	**Forest fires**		**Max. 20**
11.1	**Forest fire hazard level**		Max. **20**
	■ Last forest fire was more than 10 years ago in the immediate vicinity of the building/district	5	2.5
	■ Last forest fire was more than 20 years ago in the immediate vicinity of the building/district	10	5
	■ Last forest fire was more than 50 years ago or no forest fires in the immediate vicinity of the district	20	10
11.2	**Forest fire compensation measures**		Max. 10
11.2.1	There is a regional early warning system for forest fires and a concept for the district indicating what measures must be taken if a warning is issued.	+5	+2.5
11.2.2	The district is situated on a site that is normally not directly affected by forest fires.	+5	+2.5
11.2.3	A risk analysis has been carried out for the building.	+5	+2.5
11.2.4	The safety measures proposed in the risk analysis have been implemented.	+5	+2.5

NO.	INDICATOR	POINTS
12	**Air quality**	**Max. 20**
12.1	**Compliance with legally required limit values for air quality characteristics**	Max. 20
	In the surrounding area, the particulate matter (PM_{10}) and nitrogen dioxide (NO_2) limit values are exceeded with the following frequencies in one year:	
		+Max. 10
	■ PM_{10} exceeded on no more than 35 days	5
	■ PM_{10} not exceeded	10
		+Max. 10
	■ NO_2 exceeded on no more than 18 three-hours-intervals (over the one-hour-daily maximum value)	5
	■ NO_2 not exceeded	10
12.2	**Air quality compensation measures**	Max. **10**
12.2.1	Positive change in the emission level in the surrounding area, e.g. as a result of facade greening, the creation of ventilation corridors, photocatalysis on the facade	+5
12.2.2	A risk analysis has been carried out for the building.	+5
12.2.3	The safety measures proposed in the risk analysis have been implemented.	+5
13	**Outdoor noise**	**Max. 20**
13.1	**Outdoor noise level**	Max. **20**
	Noise level specified in accordance with table 1 or with comparable local minimum requirements for noise protection or country-specific noise maps. The worst value e.g. on map is considered for the evaluation of this indicator.	
	■ > 75 dB(A) (noise level range VI and VII in accordance with table 1)	0
	■ < 75 dB(A) (noise level range IV and V in accordance with table 1)	10
	■ < 65 dB(A) (noise level range II and III in accordance with table 1)	15
	■ < 55 dB(A) (noise level range I in accordance with table 1)	20

Reduction factor from air traffic: Aircraft noise is recorded and mapped as part of the noise mapping of environmental noise done throughout Europe (EU Directive 2002/49/EC). These noise maps, or other comparable local maps for non-EU countries, can be used for the purpose of this criterion. The allocation of points and the associated downgrading of the protection zones are based on the noise protection zones prescribed in a country. For this purpose, the location of the building and its surrounding must be examined and classified with regard to noise pollution caused by air traffic.

COLUMN LINE	1 NOISE LEVEL RANGE	2 RELEVANT EXTERNAL NOISE LEVEL	3 ROOM TYPES BEDROOMS IN HOSPITALS AND SANATORIA (CONVALESCENT HOMES)	4 COMMON ROOMS IN APPARTMENTS, OVERNIGHT ROOMS IN ACCOMMODATION SITES, CLASSROOMS AND SIMILAR	5 OFFICE ROOMS 1) AND SIMILAR
			REQUIRED $R'_{W,RES}$ OF THE EXTERNAL BUILDING COMPONENT IN DB		
1	I.	up to 55	35	30	-
2	II.	56 up to 60	35	30	30
3	III.	61 up to 65	40	35	30
4	IV.	66 up to 70	45	40	35
5	V.	71 up to 75	50	45	40
6	VI.	76 up to 80	2)	50	45
7	VII.	> 80	2)	2)	50

1) The requirements do not apply to external building components of rooms, which only make a minor contribution to the interior noise level, and are operated in order to carry out activities in the room.

2) The requirements to be determined here vary depending on local conditions.

3)

Table 1 - Airborne sound insulation minimum requirements for external building components - Source: German DIN 4109-89 Table 8

13.2	**Outdoor noise compensation measures**	Max. 10
13.2.1	Building oriented/positioned so as to minimise the noise level in common areas both indoors and outdoors (noise protection development).	+5
13.2.2	The floor plans have been drawn up so as to incorporate noise protection, so that the required indoor noise levels can be achieved without implementing active measures.	+5
13.2.3	An expert report has been drawn up for the planned building and the outdoor areas; optimisation measures have been implemented.	+5
13.2.4	The optimisation measures proposed in the expert report have been implemented.	+5

NO.	INDICATOR	POINTS
13.3	**Reduction factors for air traffic noise:** NOTE: L_{den} = overall noise indicator (or also day-evening-night noise indicator) as described in the Environmental Noise Directive EU 2002/49/EC	Reduction factor for 13.1 und 13.2
	■ Noise protection zone 1: L_{den} higher than 75 dB(A). Generally no new apartments or facilities in need of protection should be constructed in protection zone 1.	- 75%
	■ Noise protection zone 2: L_{den} 67 to 75 dB(A). No facilities in need of protection, e.g. schools, hospitals, etc., may be constructed in protection zone 2. Apartments are only possible with special sound insulation	

	requirements, but they are still severely impaired by noise since the sound insulation only applies to the interior and the exterior is still seriously affected.	-50%
	▪ Noise protection zone 3: L_{den} 62 to 67 dB(A). Protection zone 3 corresponds to the limit value for road and rail traffic in a business area.	-20%

14	**Radon**	
14.1	**The radon concentration in the indoor air is determined based on the requirements of the relevant local standards.** **Note: Limit values Q2 a/b listed in the WHO International Radiation Project (IRP) can be also considered.**	**Max. 10**
	▪ Radon ground air concentration is accurately assessed	**+5**
	▪ If the radon concentration exceeds 100 Bq/m³ appropriate remediation measures must be carried out in the building to prevent or significantly hinder seepage of radon from the ground.	+5

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The environmental effects determined in indicators 1 to 12 and their units are good key performance indicators (KPIs) to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Classification of the environmental risks in accordance with the evaluation (indicators 1–12)	[-]

Synergies with DGNB system applications

- **DGNB DISTRICT:** Indicators 1–11 correspond to the content of criterion ENV1.6, the environmental risks from the schemes for urban districts, business districts and industrial sites.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

The following benefits for companies, municipalities and/or users can be achieved:

- Increased safety for residents and users of the district against natural disasters
- Avoidance of follow-up costs for natural disasters (e.g. temporary flood protection dams, technical conversions, dismantling of buildings and/or infrastructure)
- Value stability of buildings, circulation areas and open spaces

II. Additional explanation

The number of natural disasters across the world has risen steeply over the last few years (see figure 1).
The social, economic and ecological impacts of these disasters are enormous and are impossible to quantify.

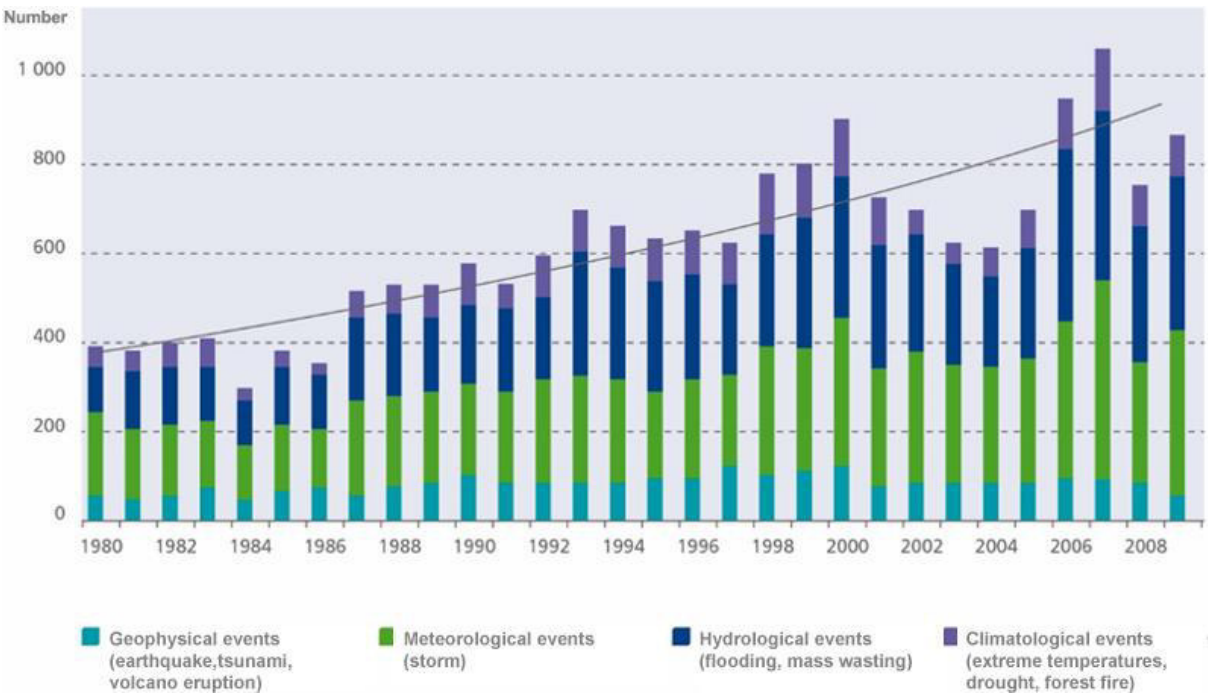

Figure 1 Number of natural disasters worldwide between 1980 and 2009 with trend line; source: Our own graph in accordance with Munich RE: "Wetterextreme, Klimawandel, Cancun 2010 Elektronische Pressemappe" [Extreme weather, climate change, Cancun 2010 Electronic press map], as of 2.11.2010

Due to the limited availability of land suitable for settlement, it will be difficult in the future to completely avoid expanding settlements onto areas exposed to certain hazards. For this reason, both organisational and structural measures must be implemented to protect people in these areas.

NOTE: the evaluation of some of the SITE1.1 indicators is based on the respective risk maps provided by the European Spatial Design Observation Network (ESPON). The ESPON maps are available online to download (see “Liter-

ature”).

For countries not covered by ESPON maps, the auditor will be required to identify alternative sources of risk data. After consultation with DGNB regarding already existing alternative sources, it is agreed that the alternative data will not use the same categorisation of risks. The points for the checklist must be recalibrated to suit the different number of risk categories in the alternative source.

III. Method

The likelihood of occurrence of natural disasters is analysed for the purpose of evaluation. Compensation measures can be credited for some natural disasters.

The criterion is evaluated based on the following indicators:

(1) Environmental risk 1 – most relevant: Factor x 1.0

(2) Environmental risk 2 – second most relevant: Factor x 1.0

(3) Environmental risk 3 – third most relevant: Factor x 0.5

The regional relevance of the natural environmental risks listed below for the district in which the building is situated must be determined (by scoping) in an initial step. For this purpose, the three most relevant environmental risks must be determined based on the described methods. The choice must be explained. This method is designed to reduce the amount of work involved (such as evaluating the risk of an avalanche on lowlands, the risk of flooding far from any bodies of water or the risk of heavy rain events).

In addition, in order to comply with the EU-Taxonomy requirements (environmental goal: mitigation of climate change), it must be specified separately in the verification process and accordingly confirmed that all physical climate risks have been analysed and in the risk analysis as well as the mitigating measures that may result from this Indicators the future climate development scenarios have been used.

The following environmental risks are considered:

Indicator 1: Earthquake

Earthquakes are regarded as measurable vibrations of the ground. Severe earthquakes can destroy houses, buildings and other structures, trigger tsunamis and landslides, and kill people and animals.
The earthquake hazard map published by the ESPON can be used (see figure 2). If available, more detailed hazard maps can generally also be used.

EMS INTENSITY	DEFINITION OF THE INTENSITY	DESCRIPTION OF THE MAXIMUM IMPACT
0–5	Imperceptible – highly perceptible	Buildings and hanging objects sway significantly, no objects are shifted from their original positions.
5–6	Highly perceptible – minor damage to buildings	Buildings in poor condition sustain minor damage (e.g. cracks appear in the walls, plastered areas fall off).
6–7	Minor damage to buildings	Sturdy buildings sustain moderate damage (e.g. small cracks appear in the walls, plaster falls off, chimney fragments fall off).
7–8	Major damage to buildings	Simple buildings sustain major damage (e.g. sections of gables and roof cornices collapse).

> 8	Destruction	Common, sturdy structures exhibit major damage (e.g. load-bearing building components collapse).

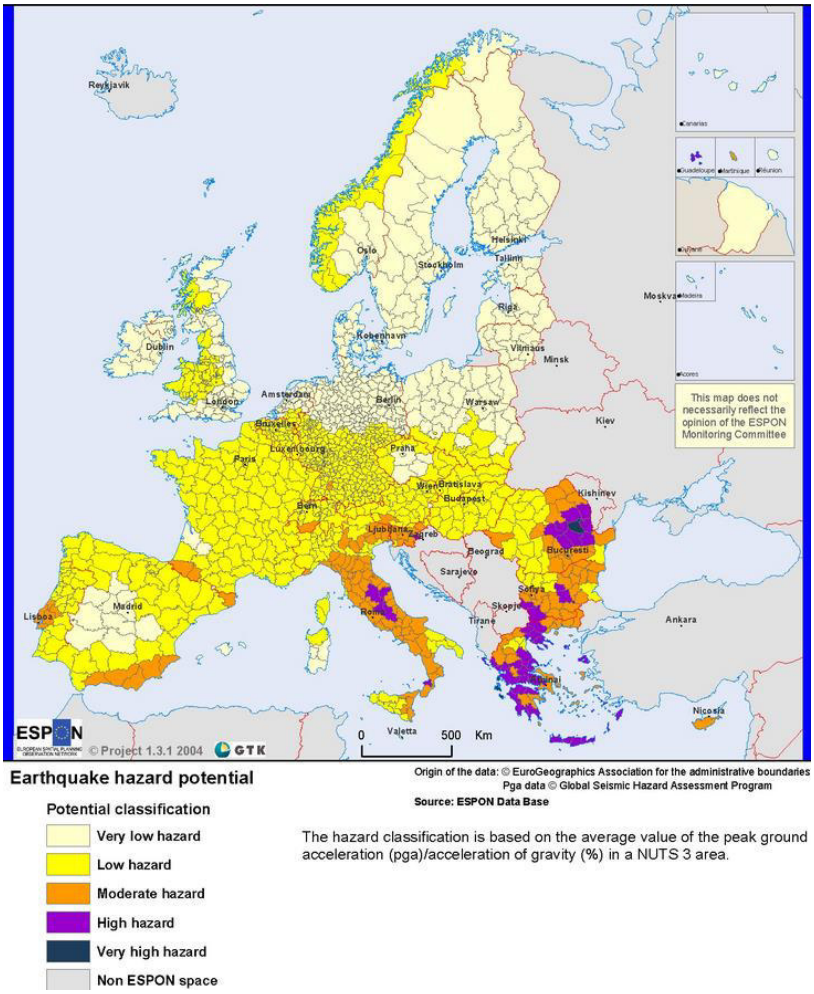

Figure 2 Earthquake hazard potential map, ESPON

Indicator 2: Volcanic eruption

Volcanic eruptions represent a serious environmental risk in some regions of the world. The risk of being affected by volcanic eruptions is assessed based on the length of time since the most recent volcanic eruption. In Europe, the volcanic hazard map published by the ESPON can be used to assess the risk. If available, more detailed hazard maps can generally also be used.

Indicator 3: Avalanches

Avalanches are defined as large masses of snow or ice which break loose from mountain slopes and slide or rush down into a valley. Avalanches that cause significant injury and damage to property and the environment are classified as natural disasters. The risk of avalanches is particularly high in the foothills of the Alps (see figure 3).

The evaluation assesses the hazard level and the measures put in place to protect against avalanches. The hazard level is determined based on the regional and current avalanche hazard map (combination of intensity and likelihood of occurrence) containing the categories 0 (no risk, white), 1 (low risk, yellow), 2 (occasional risk, blue) to 3 (considerable risk, red), which is published by the municipalities in question, if relevant to the region.
As a rule, the evaluation should be carried out using local detailed avalanche maps. If these maps are not available, the ESPON avalanche hazard map can be used (see figure 4).

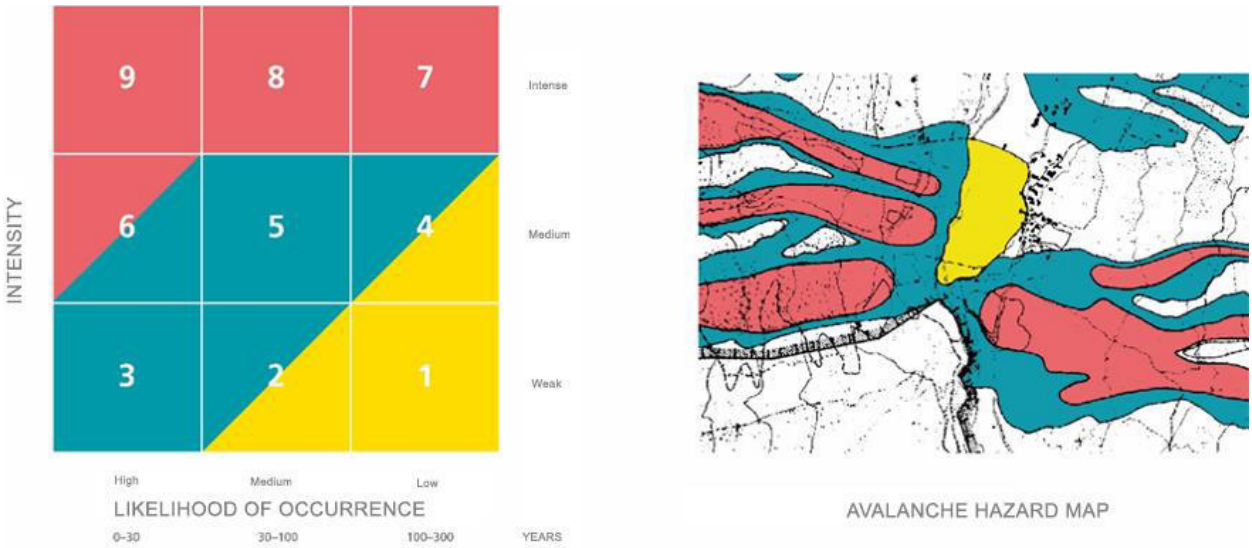

Figure 3

Likelihood of occurrence (left) – Source: *VKF Wegleitung Objektschutz gegen gravitative Naturgefahren* [Association of Swiss Canton Fire Insurance Companies guide: Local protection against gravitational natural hazards].
Avalanche hazard map (right) – Source: *Bundesamt für Umwelt: Richtlinien zur Berücksichtigung der Lawinengefahr bei raumwirksamen Tätigkeiten* [Ministry of the Environment Guidelines for taking into consideration the risk of avalanches in the context of land-use-related activities]. Formerly *Bundesamt für Forstwesen und Eidg. Institut für Schnee- und Lawinenforschung* [Federal Agency for Forestry and Federal Institute for Snow and Avalanche Research], Bern, 1984.

REGIONS	RISK
White	No risk or negligible risk
Yellow	Low risk
Blue	Rare / moderate avalanches (structural measures must be implemented, risk primarily outdoors, building permits are therefore linked to conditions and evacuation plans are required for the residents)
Red	Critically (high / very high) vulnerable area (destroyed buildings can be expected after an avalanche) No new construction zones may be drawn in the red zone. In addition, no buildings or facilities may be constructed or extended.)

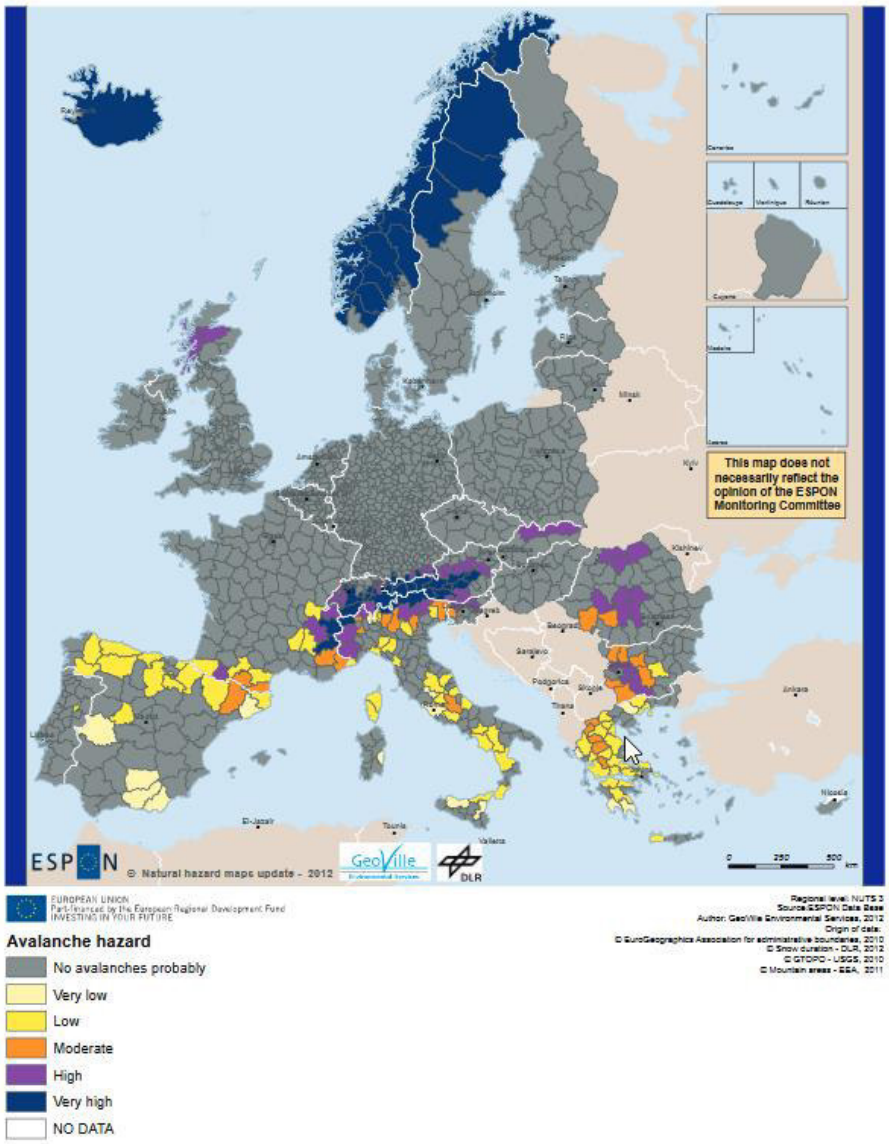

Figure 4 Avalanche hazard potential map, ESPON

Indicator 4: Storm

A storm is defined as wind with speeds of at least 20.8 m/s (74.9 kph) or 9 on the Beaufort Scale. Direct storm damage primarily affects roof coverings and other objects that can be carried by the wind; in heavily forested areas, damage also occurs due to uprooted or snapped trees. Indirect damage is also significant, for example as a result of sand deposited on agricultural land in a sandstorm or as a result of hailstones.
The evaluation assesses the storm damage risk and the measures in place to increase protection against storms. The storm damage risk is determined using the storm hazard map published by the ESPON (see figure 5). If available, more detailed hazard maps can generally also be used.

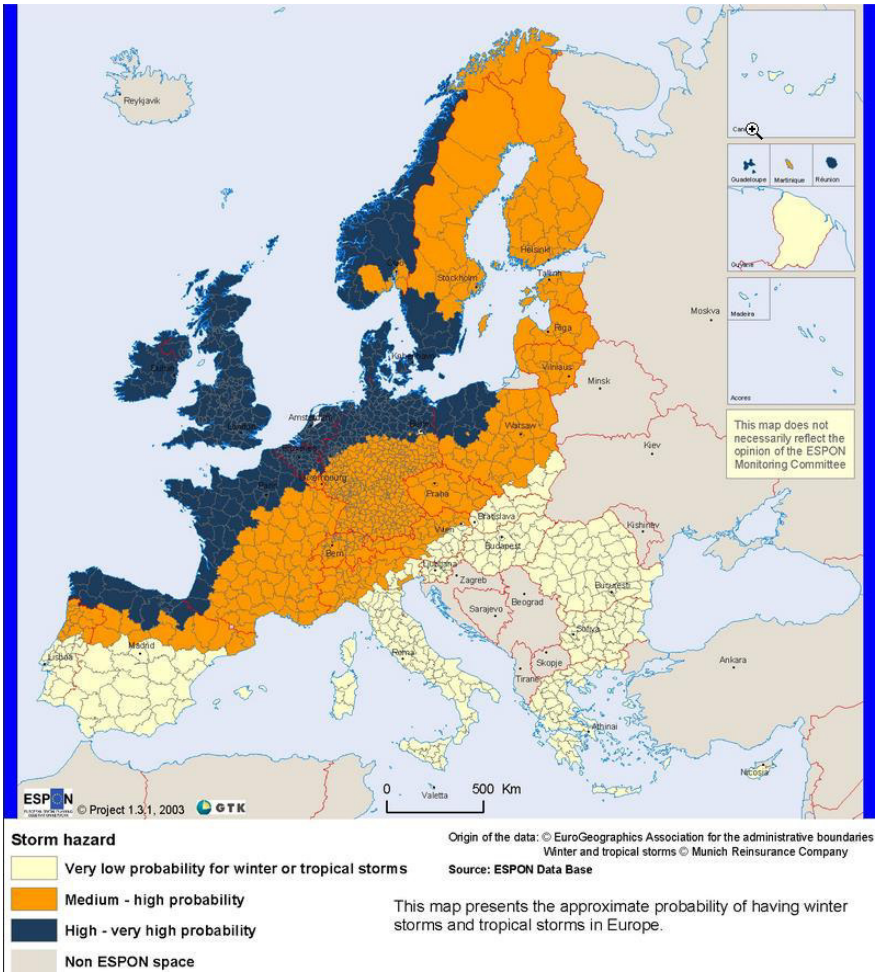

Figure 5 Storm hazard map, ESPON

AVERAGE WIND SPEED	DEFINITION	DESCRIPTION OF THE MAXIMUM IMPACT
21–24 m/s	Storm	Minor damage to houses (roof tiles come loose)
25–28 m/s	Severe storm	Wind snaps trees, major damage to buildings
29–32 m/s	Violent storm	Wind uproots trees, propagates storm damage
> 33 m/s	Hurricane	Major devastation

Indicator 5: Floods

Flooding is generally a natural occurrence. It is classified as a disaster (flood disaster) when human lives are affected. The more intensively the land is used, the larger the amount of area exposed to the risk of flooding. This increased threat of flooding is despite the improvement of flood prevention measures developed over the centuries. The evaluation assesses the risk of flooding and the flood prevention measures in place. The risk of flooding is

determined based on the flood hazard map of the relevant German federal state. Four flood scenarios are shown on the maps: High probability of flooding (HQ 10–50), medium probability of flooding (HQ 100), extreme events with partial failure of the flood defences (HQ 200) and no risk of flooding.
In principle, the evaluation should be carried out using local detailed flood maps (see example in Figure 6). If these maps are not available, the ESPON database can be used (flood recurrence map, precipitation contributing to flood risk).

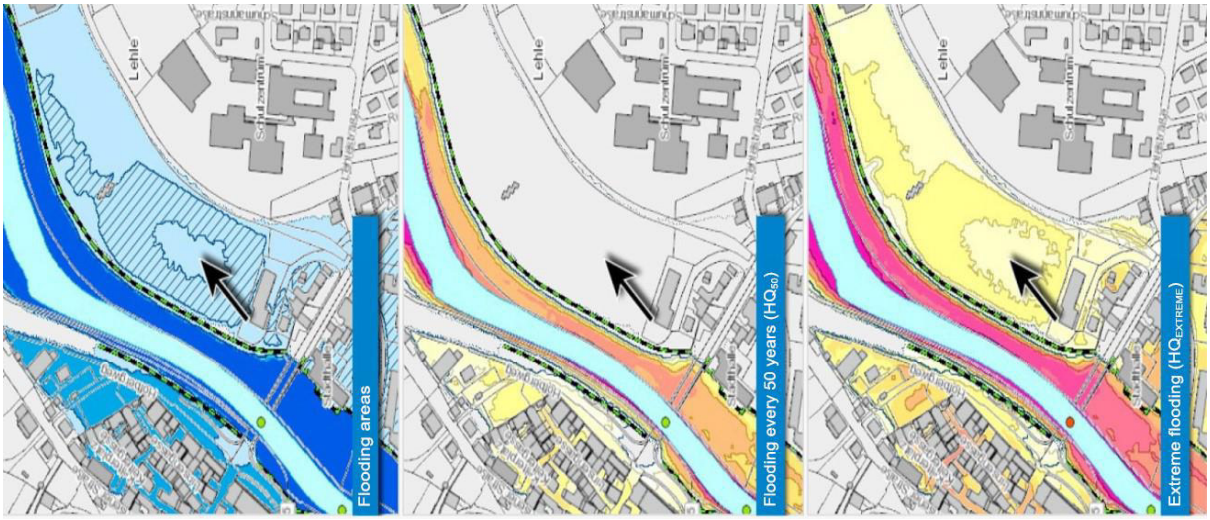

Figure 6 Extract from the Baden-Württemberg flood risk map; source: Data from the *Räumlichen Informations- und Planungssystem* (RIPS) [Land-use information and planning system] of the *Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg* [Baden-Württemberg State Institute for the Environment, Measurements and Nature Conservation]; 14.09.2017. Link: http://www.lubw.baden-wuerttemberg.de. For basic data: "*Geobasisdaten* [Basic geographic data] © *Landesamt für Geoinformation und Landentwicklung Baden-Württemberg* (LGL) [Baden-Württemberg State Office for Geographic Information and Land Development], www.lgl-bw.de, ref.: 2851.9-1/19"

Indicator 6: Heavy rain

Heavy rain events result in flash floods or deluges when the rainwater can no longer infiltrate into the ground, or when the volume of rainwater is too much for the drainage system or bodies of water to accommodate and drain away. This is affected by the topography of the area in which the plot of land is situated, its soil sealing factor, any rainwater retention systems in place and the dimensions of the drainage system (appropriate compensation measures can be used to counteract the effects of heavy rain).

The following factors have a particularly negative impact in this regard:

- Risks to the plot of land due to surface runoff from adjacent roads or land
- Ground-level entrances or terraces
- Pavements, driveways, parking spaces are at an incline with respect to the building
- Water can flow from the adjacent road into the underground garage

The evaluation should be carried out using local detailed flood maps (see example in figure 7).

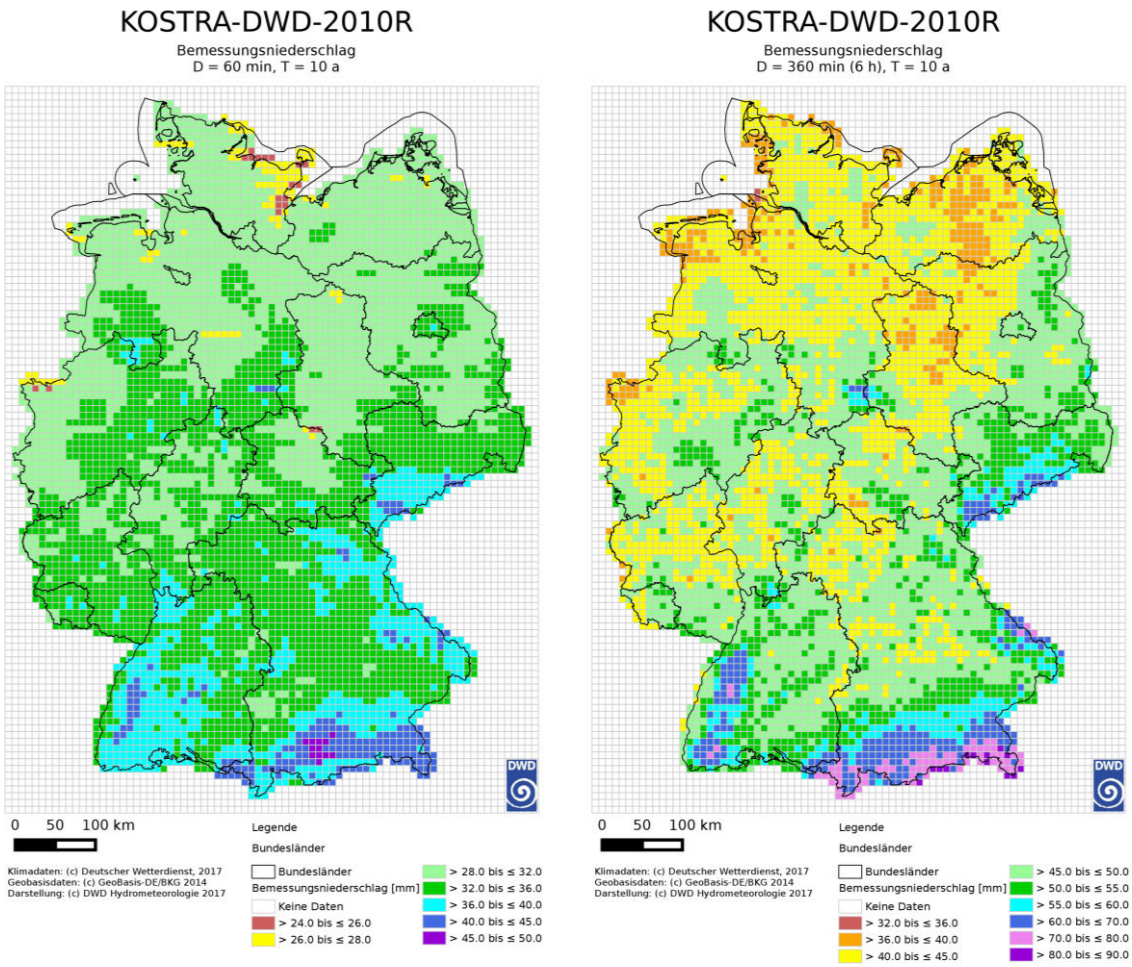

Figure 7 Coordinated heavy rain regionalisation and analysis by German Meteorological service (KOSTRA-DWD) 2010R (updated data set) for one hour (left) and six hours (right) and a recurrence interval of 10 years. Source: *Deutscher Wetterdienst (DWD)* [German weather service – Hydrometeorology department]

Indicator 7: Hail

There is currently insufficient information about small scale extreme weather events such as hail. In Europe, the ESPON map for extreme precipitations - heavy rainfall and hail can be used to assess the risk. If available, more detailed hazard maps can generally also be used (see examples in figures 8 to 10).

Figure 8 Hail zones low – high. Source: German Federal office of Civil Protection and Disaster Assistance (BBK), https://www.bbk.bund.de/SharedDocs/Bilderstrecken/BBK/DE/2017/Sturmsicher_bei_Unwetter/PM_Sturmsicher_bei_Unwetter.html

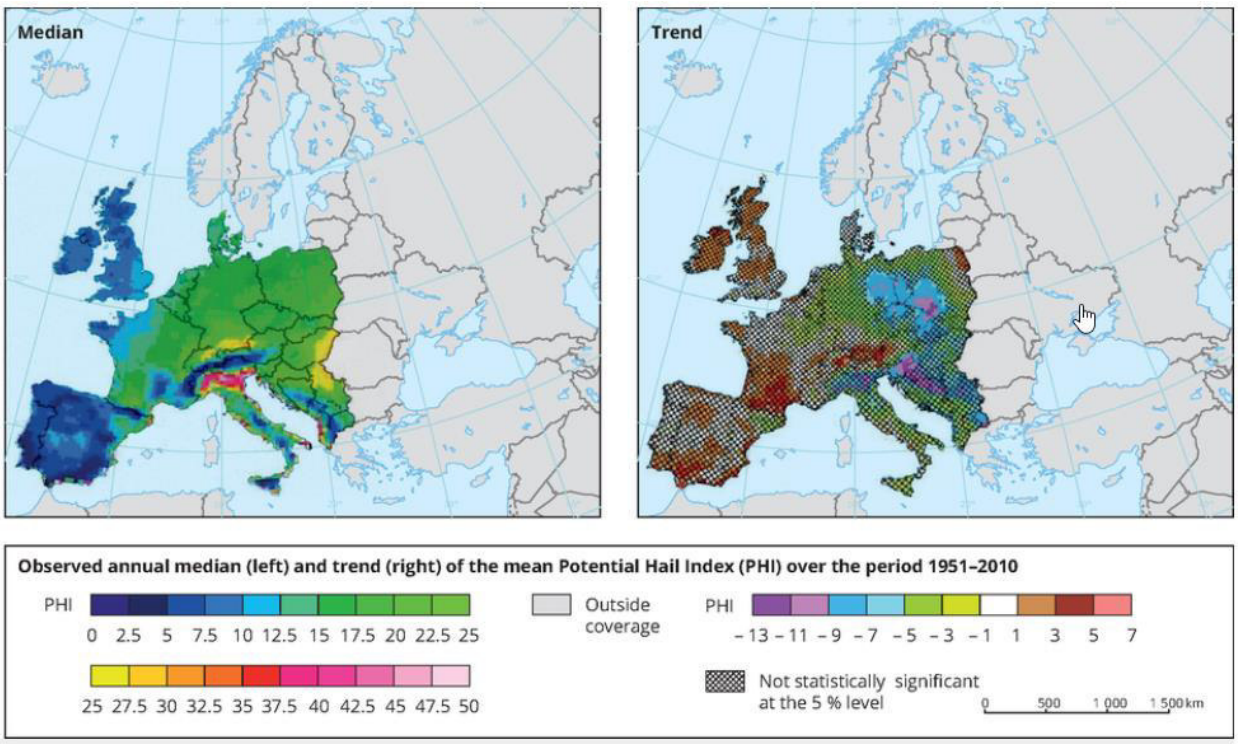

Figure 9 Observed annual median and trend of the Mean Potential Hail Index (PHI) over the period 1951-2010 – Source: Based on the logistic hail model (Mohr, Kunz, and Geyer, 2015) and reanalysis data from NCEP-NCAR

(Kalnay, et al., 1996). https://www.eea.europa.eu/data-and-maps/indicators/hail/assessment

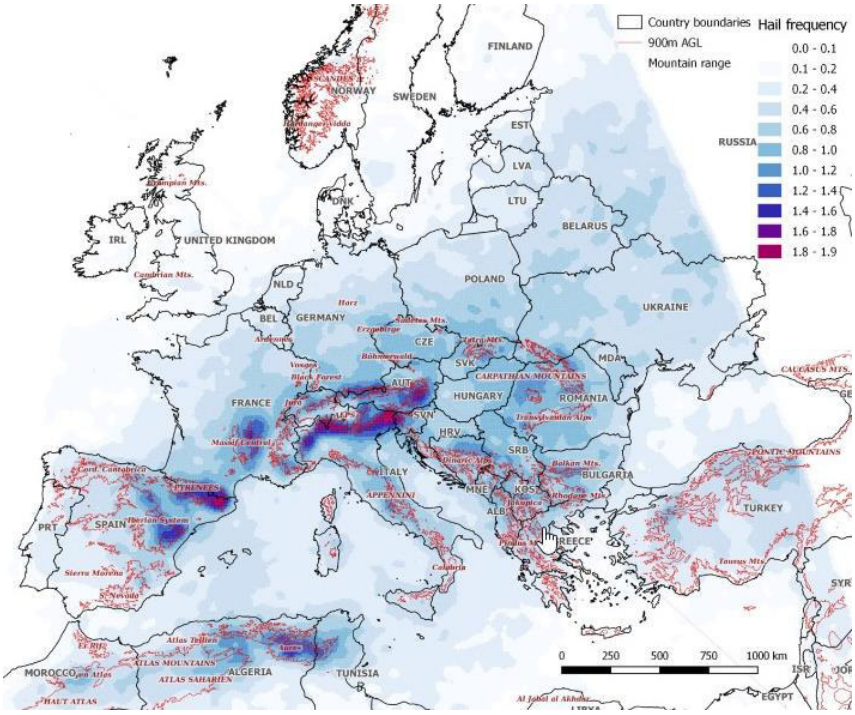

Figure 10 Hail frequency estimation – Source: Hail frequency estimation across Europe based on a combination of overshooting top detections and the ERA INTERIM reanalysis. Authors: H. J. Punge, K. M. Bedka, M. Kunz, A. Reinbold

Indicator 8: Landslide/subsidence

A landslide is regarded as the flow of large masses of earth and rock, mostly triggered by heavy rainfall (long-lasting rain or heavy rain) and the resulting penetration of water between previously bound soil layers.
The risk (e.g. due to mining in the past, a sloping location or civil engineering measures) and the compensation measures are evaluated. The ESPON landslide hazard map can be used to establish whether the issue of landslides/subsidence might be relevant to the district. If available, more detailed hazard maps can generally also be used.

Indicator 9: Storm surge/tsunami

Tsunamis and storm surges represent a serious environmental risk in some regions of the world.
The risk of being affected by tsunamis and/or storm surges is evaluated in Europe by means of the hazard maps published by the ESPON (tsunami hazard map, storm surge hazard map). If available, more detailed hazard maps can generally also be used.

Indicator 10: Extreme climates

Extreme climates (heat waves/cold waves) represent a serious environmental risk in some regions of the world. The risk of being affected by extreme climates is evaluated in Europe by means of the extreme temperature hazard map

published by the ESPON. If available, more detailed hazard maps can generally also be used.

Indicator 11: Forest fires

The risk of forest fires is becoming greater due to increasing prolonged dry periods. The risk of being affected by forest fires is assessed based on the length of time since the most recent forest fire. In Europe, the risk maps published by the ESPON (wildfire hazard map, length of dry spell affecting forest fires) can be used to assess the risk. If available, more detailed hazard maps can generally also be used.

Indicator 12: Air quality

The air quality at the site is evaluated in relation to traffic, the main source of pollution. For this purpose, measurements are taken to determine whether the particulate matter (PM_{10}) and nitrogen dioxide (NO_2) levels at the site comply with the legal limit values. The planned building must also not increase the emission level in the surrounding area to such an extent that the limit values are expected to be exceeded.

(1) Assessment of the initial situation based on the limit values specified in table 2.
(2) Improvement of air quality as a result of planning – an emission forecast is used for the evaluation. The procedure is described in more detail in the Evaluation section.

AIR POLLUTANTS	[µG/M³]	DESCRIPTION
Particulate matter PM_{10} Annual average	20	Emission limit value averaged over a calendar year for the protection of human health
Particulate matter PM*10* Daily average	50	Emission limit value averaged over 24 hours for the protection of human health with 35 permitted instances of exceedance per calendar year
Nitrogen dioxide NO_2 annual average	40	Emission limit value averaged over a calendar year for the protection of human health
Nitrogen dioxide NO_2 Max. 1-hour value	200	With 18 permitted instances of exceedance per calendar year

Table 2 – Limit values for particulate matter (PM_{10}) and nitrogen dioxide (NO_2) – Source: 39_{th} German Federal Pollution Control Ordinance (*39. BImSchV*)

For the evaluation of particulate matter, the most up-to-date publicly available table of World Health Organization (WHO) can be also used (e. g. https://www.who.int/data/gho/data/themes/air-pollution/who-air-quality-database). For

the assessment of the PM_{10}-value the auditor has to select the country and city nearest to the project site and assign the checklist points according to the associated particulate matter values.

Compensation measures for indicator 12: Air quality

Active measures to improve the air quality on the facade or in the building's outdoor area will be reflected positively in the evaluation. Points will be awarded when clear evidence can be provided, e.g. in the form of measurements, that these measures directly result in the improvement of air quality. Measures to improve the air quality include for example façade greening and/or the use of proven air-purifying materials.

Indicator 13: Outdoor noise

Outdoor noise comprises of a combination of noise sources from the area surrounding the building: Noise from road traffic, from business and industry, and from rail and air traffic. Noise level maps or measurements that indicate the level of noise exposure on the property are used for the purposes of calculation and awarding points. The value is categorised based on the "relevant outdoor noise level" in accordance with table 1 of this criterion (airborne sound insulation requirements for external building components). The noise level used for the evaluation should be the worst noise level on the plot of land.

If the area is very noisy to begin with, this can be significantly improved by implementing compensation measures. Implementing the points below will be reflected positively in the evaluation.

Planning options:

- Large distance from the noise source
- Design that incorporates an intrinsic shielding effect
- Use of natural shielding measures (soil embankments, etc.)
- Smaller building apertures and openings exposed to the noise source (driveways, courtyard openings, windows, loggias, etc.)
- Other passive shielding measures (noise barrier, baffles, etc.)
- Cleverly configured floor plan

Indicator 14: Radon

Radon seeps out of soil and into buildings through cracks and holes in the foundation slabs and walls or through cable and pipe conduits. If buildings are not sufficiently ventilated, radon can accumulate e.g. in building basement and in decreasing concentrations in subsequent storeys. Unlike most chemical pollutants it is not possible to smell or taste radon; therefore the only way to know whether there is radon in a building and how much of it is present is to measure it.

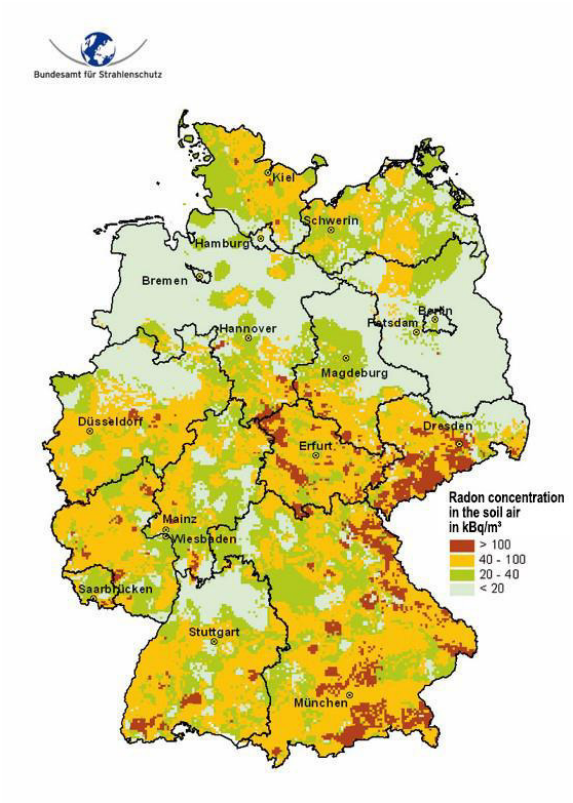

Figure 11 Overview of the radon concentration in the soil air at a depth of 1 metre - Source: *Bundesamt für Strahlenschutz* [German Federal Office for Radiation Protection]

If the radon concentration in the building area exceeds 100 Bq/m³ remediation measures must be carried out. The extent of these measures depends on the extent to which this value is exceeded. Simple measures should be tried first. If these measures do not achieve the desired target, more extensive procedures must then be considered. They may include changes to the building; therefore these must be planned and carried out by experienced specialists. Example of remediation measures are listed below:

- Simple measures
  - Air ventilation for five to ten minutes several times a day by opening windows opposite each other in each storey including the basement
  - Sealing of all supply and sewage lines, small cracks and doors between the basement and the subsequent storey
  - Installation of a ventilator, for example to create a slight vacuum or overpressure, or vent air through an unused flue

- Extensive measures
  - Ensure the basement is well sealed off from the subsequent storey, for example by fitting particular airtight doors
  - Sealing of floors, walls, ceilings using foil or other materials that are resistant to radon penetration
  - Installation of ventilation systems to increase the air exchange rate
  - Installation of radon wells or lay drainage beneath the foundations to draw off the air containing radon

Compensation measures -all indicators-

Compensation measures can be considered for some environmental risks. Possible compensation measures are described in the "Evaluation" section.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

DESCRIPTION	SHORT CODE
Credible declaration of intent that measures will be implemented/ assessment of the evaluation	A
Brief explanation, photos/plans of the implemented measures/concepts and, if necessary, mapping in an overall plan	B
Project design	C
Localisation of the project area on risk maps and evaluation	D
Statement by a qualified expert or by a public institution stating whether the site is affected by the particular risk	E

ENVIRONMENTAL RISKS/COMPENSATION MEASURES	PRE-CERTIFI-CATE	CERTIFI-CATE
1. Earthquake	A, B, D	B, D
2. Volcanic eruption	A, B, D	B, (D), E
3. Avalanches	A, B, D	B, D
4. Storm	A, B, C, D	B, C, D
5. Floods	A, B, D	B, D
6. Heavy rain	A, B, D	B, D
7. Hail	A, B, D	B, D
8. Landslide/subsidence	A, B, D	B, (D), E

9. Storm surge/tsunami	A, B, D	B, D or E
10. Extreme climates	A, B, D	B, D or E
11. Forest fires	A, B, D	B, D or E
12. Air quality	A, D	
13. Outdoor noise	B, D	
14. Radon	B, D	B, E

APPENDIX C – LITERATURE

I. Version

Change log based on version 2020

PAGE	EXPLANATION	DATE
663	General: scheme “assembly buildings” has been added	16.09.2021
all	Evaluation: editorial amendment to the “max. Points"	16.09.2021
675	Method - overarching: Note on EU taxonomy compliance	16.09.2021
685	Indicator 12: Designation of alternative compensation measures	16.09.2021

II. Literature

- Risk maps published by the European Spatial Design Observation Network (ESPON): www.espon.eu.
- Sustainable Development Goals icons, United Nations/globalgoals.org.
- Environmental Noise Directive EU 2002/49/EC: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0049&from=EN
- External air quality (some examples from WHO-Website):
  - https://gateway.euro.who.int/en/indicators/enhis_24-population-weighted-annual-mean-pm10-in-cities/visualizations/#id=21390
  - https://gateway.euro.who.int/en/indicators/enhis_24-population-weighted-annual-mean-pm10-in-cities/visualizations/#id=21390&tab=table
  - http://www.who.int/airpollution/data/AAP_database_summary_results_2018_final2.pdf?ua=1
  - http://www.who.int/airpollution/data/cities/en/
- WHO International Radiation Project (IRP): http://www.who.int/ionizing_radiation/env/radon/IRP_Survey_on_Radon.pdf
- A healthier home: but how?: https://www.umweltbundesamt.de/sites/default/files/medien/publikation/long/3085.pdf
- What is radon?: http://www.bfs.de/EN/topics/ion/environment/radon/introduction/introduction.html

SITE1.2

Influence on the district

Objective

Our objective is to use the building to provide a boost to the site and exert a positive influence on the district.

Benefits

The image of a site has a significant influence on how the building and its vicinity are received by its users and visitors, and on the building's ability to play a productive role in the district. In terms of a building's economic and social quality in particular, it is therefore vital that it not only satisfies functional requirements, but that it also conveys a positive image.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)	CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY
Moderate	8.2 Diversify, innovate and upgrade for economic productivity 8.3 Promote policies to support job creation and growing enterprises	

Outlook

The site on which a building is constructed will always play an important role. Its image is subjected to a variety of different influences. These factors will always remain a focal point.

Share of total score

	SHARE	WEIGHTING FACTOR
Office, Education, Residential, Hotel, Consumer market, Shopping centre, Department stores, Logistics, Production, Assembly buildings	1.1%	2

EVALUATION

The evaluation assesses the results of a site analysis, the qualitative impact of the building on the site or the district, the potential for synergy and whether the building will provide a boost to the local area/be an attraction. In this criterion, a maximum of 100 points can be awarded.

NO.	INDICATOR	POINTS
1	**Site analysis**	
1.1	**Site classification and evaluation** Expert, reasoned evaluation of whether the public perception of the site will allow the planned project to be used sustainably or whether it detracts from this ambition.	**Max. 15**
	■ Site with a neutral image and secondary location in the district; impact is neither positive nor negative: Acceptable image for the intended use/for the building/site impact is neutral and multipurpose.	5
	■ Site has positive local impact and/or exposed location in the district as a whole: positive image of the building/site due to its location in the district is the basis for high-quality architecture and use.	10
	■ Site has positive impact regionally and nationally; alternatively/in addition to: the site is a landmark and has a desirable location within the district: Very positive image for the intended use/for the building. The site has a special significance due to its location or history.	15
2	**Image and site value appreciation**	
2.1	**Influence of the building on the site or the district**	**Max. 15**
	■ Building has a neutral image; impact neither positive nor negative: Acceptable image for the district. The building and its use fit into the existing structure.	5
	■ Building has a positive local impact: positive image for the district. The building and its use enhance the district with a unique impact and character; the building has a regional pull.	10
	■ Building has a positive impact regionally and nationally: very positive image for the district. The building and its use make the district a desirable area. National pull due to use or building.	15

3 Potential synergy

3.1 Potential synergy due to clustering — Max. 40

- Building with neutral, integrated use and impact on the surrounding area — 5
- Building/use with at least two synergistic effects at technical or economical, usage or social level that form a cluster configuration that is highly attractive to customers and users, who are therefore closely connected to associated companies or even competitors. — 10
- Building/use with at least three synergistic effects at technical or economical, usage or social level that form a cluster configuration that is highly attractive to customers and users, who are therefore closely connected to associated companies or even competitors. — 20

For each additional synergistic effect — +10

Examples:

- **Technical:** smart grid
- **Economic:** suppliers, after-sales, attractive for other uses or to other companies, etc.
- **Mixture/use:** supermarket, office, business, symbiotic relationship (e.g. academy – hotel, business park – boarding house)
- **Social:** day nursery, leisure (restaurant, fitness, etc.)

4 Boost/attraction

4.1 Boost due to use — 15

There is a new use/a new building for the district, which adds a unique feature to the region/attracts people from around the country and/or attracts new uses/employers/leisure attractions (e.g. outlet centres, experiences, etc.)

4.2 Boost due to spatial and design aspects — 15

Building/use as a unique building project that makes the district a desirable area and "stimulates" the district (e.g. 50Hertz building in Berlin) or building/use after which a district is named (e.g. Alnatura Campus, Ricola Kräuterzentrum, Torre Agbar, Kulturbrauerei Berlin, ZKM Karlsruhe, etc.).

Re 4. INNOVATION AREA — As in 4.

Explanation: if this building gives an exceptional boost to the district/site that goes beyond the scope of the aspects defined above, this can also be credited. This can include, for example, architectural or civil engineering innovations.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The synergistic effects determined in indicator 3 are good key performance indicators (KPIs) to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Synergy exists in the surrounding area	Yes/no

Synergies with DGNB system applications

- **DGNB DISTRICT:** Indicators 1 and 2 have parallels to the content of criterion ECO2.4 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Buildings with a positive image and varied uses for the public foster communication, a sense of community and, in turn, general acceptance. The image of a site depends on its use; however, the site's image also influences its subsequent use. A positive image plays a key role in ensuring that the building continues to be accepted in the long term by its users and visitors.

II. Additional explanation

The building and its surrounding area are to be characterised according to their image and status, and evaluated according to their impact and influence (social, ecological, economic) on the district.

III. Method

The criterion SITE1.2 describes the influence of the site on the building's commercial viability, as well as the influence of the building itself on the site. If this is positive, this has a critical impact on the evaluation.
The following parameters in particular play a pivotal role in ensuring that the site (and in turn, the building) is received positively by potential users:

Indicator 1: Site analysis

An analysis of the surrounding area is advisable here. Firstly, the location of the property in the district (500 m radius) must be considered (from secondary to exposed). Secondly, an analysis of the surrounding area with regard to uses must be conducted; this can include (but is not limited to) the following aspects:

- Evidence of integration
- Additional use
- New stimuli (headquarters, outstanding shopping facilities, facilities for art and culture, etc.).

Indicator 2: Image and site value appreciation

The focus here is on reactions as part of public perception. Publications in specialist magazines and press articles about the building and/or its users in connection to the site can be used (best case scenario: The district is named after the user or the district is identified by the user's name).

Indicator 3: Potential synergy

Synergy can occur on multiple levels. Possible examples:

- By means of material cycles (e.g. chemical industry business park: businesses are integrated into the material cycle).
- Office buildings without a canteen (employees use canteens in neighbouring buildings or restaurants/sandwich shops are encouraged to move into the area).
- Office building uses waste heat from business in the vicinity to heat the interior.

Indicator 4: Boost/attraction

This indicator is used to award points for highly attractive buildings and uses with an impact that goes beyond the district. Possible examples:

- Building/use as a "place of pilgrimage" with documentation showing at least 15 tours conducted a month for interested parties from the fields of architecture, engineering, ecology, products, etc.
- Attractive shopping facilities that are not available further afield

General information:
If the building being evaluated will have a positive influence on the existing site, this should be evident from the analysis. The documentation listed below should be produced as required and where the relevant items are present. A clear relationship to the project must be demonstrated. Different synergistic effects are possible depending on the use. Clear evidence must be provided to demonstrate that the aspect "Building/use as a unique building project that makes the district a desirable area and 'stimulates' the district" in indicator 4.2 has been fulfilled.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements. The data used must be up-to-date or, if relatively old documents/content are/is used, they must demonstrate that they continue to be applicable.

Indicator 1: Site analysis

Excerpt from the written text and drawings defining the building's specifications, which clearly contain the following information: Expert, reasoned evaluation of whether the public perception of the site will allow the planned project to be used sustainably or whether it detracts from this ambition.

An analysis of the surrounding area with regard to the following aspects:

- Location of the property in the district (radius approx. 500 m)
- Uses in the district (radius approx. 500 m)
- Location of the building in relation to the surrounding area
- Information on the building's function, use and accessibility

Indicator 2: Image and site value appreciation

Characterisation of the building according to its impact on the surrounding area. It can be classified using press articles, photos, plans, etc. that reflect public perception.

Indicator 3: Potential synergy

Documentation of the uses with additional synergistic effects that form a cluster configuration. Description and explanation of the synergistic effects.

Indicator 4: Boost/attraction

Description and explanation of the following:

- Unique features to the region,
- Attraction of people from around the country and/or
- New uses/employers/leisure attractions

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
692	General: scheme “assembly buildings” has been added	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org

SITE1.3

Transport access

Objective

Our objective is to promote sustainable mobility in various forms for the building users and to ensure that sustainable traffic infrastructure is created.

Benefits

Sustainable, intelligent traffic infrastructure allows users to choose the most appropriate means of transport for their individual needs. If a wide variety of mobility provisions are offered, it can be assumed that the use of motorised private transportation, and hence the associated amount of pollution and other negative effects will be reduced. Furthermore, user satisfaction with the site and the building will increase, affordable mobility will expand and more people are encouraged to take up healthy, active modes of travel like walking and cycling.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
Significant	3.4	Reduce mortality from non-communicable diseases and promote mental health	3.2.a/b	Air pollution
	3.9	Reduce illnesses and death from hazardous chemicals and pollution	11.2.b	Mobility
	9.1	Develop sustainable, resilient and inclusive infrastructures	13.1.a	Climate protection
	9.4	Upgrade all industries and infrastructures for sustainability		
	10.2	Promote universal social, economic and political inclusion		
	11.2	Affordable and sustainable transport systems		
	11.6	Reduce the environmental impact of cities		
	11.7	Provide access to safe and inclusive green and public spaces		
Moderate	11.b	Implement policies for inclusion, resource efficiency and disaster risk reduction		
	13.2	Integrate climate change measures into policies and planning		

Outlook

Mobility is currently undergoing radical change (e.g. electric vehicles). Current and future developments are being monitored and deliberated.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel** **Consumer market** **Shopping centre** **Department stores** **Logistics** **Production** **Assembly buildings**	**1.1%**	**2**

EVALUATION

Mobility is intrinsically linked to the building and its infrastructure, both as a starting point and an end point. One of the primary concerns besides a location that is easy to travel to is the quality of the transport links using alternative modes of transport.
A qualitative-quantitative method is used to evaluate the proximity and type for the indicators motorised private transportation, public transport, cyclists, pedestrian traffic and the barrier-free design of bus stops.

Innovative mobility elements can be achieved using the innovation area indicator. The number of points available therefore adds up to more than 100 points; however, no more than 100 points can be awarded in total. Depending on the use, the content of the indicators can be applied accordingly.

Measurement of the distance: If there is a considerable obstruction (river, motorway, rails, etc.) between the building and the target object, the real distance (walking/driving path) must be used.

NO.	INDICATOR	POINTS
1	**Motorised private transportation**	
1.1	**Surrounding area:**	**Max. 15**
	■ Access to a trunk road	+5
	■ Access to a highway	+5
	■ Access to a main road	+5
1.2	**Building-related**	
	The parking spaces allocated to the building are integrated into a higher-level parking concept	**10**
2	**Public transport**	
2.1	**Stops**	
	Direct distance 350 m	**5**
2.2	**Access to the nearest railway station**	**Max. 5**
	■ ≤ 20 minutes	1
	■ ≤ 15 minutes	2.5
	■ ≤ 10 minutes	5
2.3	**Public transport frequency**	**Max. 5**
	■ Every 15 minutes max.	1
	■ Every 10 minutes max.	2.5
	■ Every 5 minutes max.	5
2.4	**Building-related**	**Max. 10**
	■ Access to passenger information (permanent notice or digital display)	+5
	■ A map of the surrounding area is displayed, showing the location of bus stops and how far away they are in minutes; alternatively, signposting is provided	+5

3	**Cyclists**	
3.1	**Bicycle paths (500 m)**	**Max. 5**
	■ Partially mixed with vehicular traffic	2.5
	■ Not mixed with vehicular traffic/shared space or bicycle lane	5
3.2	**Access**	**Max. 5**
	■ Regional access and continuity	2.5
	■ National access (> 10 km) and continuity	5
3.3	**Building-related**	
	Access road within the boundaries of the property leading directly to the building/parking facilities	**5**
4	**Pedestrian traffic**	
4.1	**Pedestrian path network (radius of 350 m from the main entrance)**	**2–5**
	■ Up to 50% of walking possibilities covered	2
	■ More than 80% of walking possibilities covered	3
	■ All walking possibilities covered	5
4.2	**Crossing possibilities**	**3–5**
	■ Direct crossing is possible for at least 80% of paths	3
	■ Direct crossing is possible without any restriction	5
4.3	**Signage**	**Max. 5**
	■ Extensive signage	3
	■ Extensive signage and extensive navigation maps	5
5	**Barrier-free design of stops**	
5.1	**Barrier-free access to nearby public transport stops**	**5–10**
	Height differences and clearances ≤ 3 cm, access points marked, weather protection	
	■ Covers up to 80% of access points	5
	■ Covers all access points	10
5.2	**Barrier-free design of the path to the building and the area surrounding it**	
	No visual obstructions, tactile guiding elements, dips, area is not crossed by cyclists	**10**

Re 1–5	**INNOVATION AREA** Explanation: The evaluation examines whether innovative mobility elements have been introduced, which are tailored to the specific conditions of the building and compensate for difficulties in terms of transport access and mobility infrastructure. If additional mobility elements such as shuttle, company bicycles or company tickets are offered to the building users, or other effective means of achieving the same objectives are placed at their disposal, such as district-based mobility management, company mobility management (car and bike sharing and their integration with the public transport network) and innovative developments in the surrounding public transport network, points can be awarded in accordance with the evaluation scheme in indicators 1–5. ■ For each innovative mobility element	**As in 1–5** **+5**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The elements listed below are good key performance indicators (KPIs) to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Number of access links to roads for motorised private transportation	[number]
KPI 2	Number of nearby public transport stops (< 350 m), stations (< 10 minutes)	[number]
KPI 3	Number of nearby cycle paths (< 500 m)	[number]
KPI 4	Number of nearby pedestrian path networks that cover all walking possibilities	[number]
KPI 5	Fully barrier-free public transport stops	Yes/no
KPI 6	Number of innovative mobility elements	[number]

Synergies with DGNB system applications

- **DGNB DISTRICT:** Indicators 1–4 and 6 correspond to the content of criteria TEC3.1 and TEC3.2 (mobility infrastructure for motorised/non-motorised transportation) from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

The objective is to conserve resources and increase user comfort by means of a sustainable mobility infrastructure for traffic.
The following benefits for companies, municipalities and/or users can therefore be achieved:

- Easy accessibility for everyone, not limited to a specific means of transportation
- Increase in environmental quality, i.e. reduction in the environmental impacts of individual motorised transportation
- Better quality of life
- Improved accessibility, especially for pedestrians and cyclists, as well as road users with restricted mobility

II. Additional explanation

Mobility is currently an important site factor. The presence of different modes of transport and prioritising time efficiency and convenience when integrating them into the transport network result in a high level of acceptance and use by the building's users.

The concept of mobility is defined as an integrated approach to motorised and non-motorised transportation with the objective of giving equal priority to both, from the design phase to the implementation phase, right through to the use phase.

III. Method

The mobility infrastructure (in conjunction with TEC3.1) supports facilities for electric vehicles and car sharing and measures to encourage cycling and pedestrian traffic.

Indicator 1: Motorised private transportation

- The building must be accessible by motorised private transportation; the type of roads depends on the site and the scheme. Parking spaces for employees, visitors and other users are also necessary. It is advantageous if the parking spaces allocated to the building are integrated into a higher-level parking concept.

Indicator 2: Public transport

- A well-developed public transport network within easy reach of the site and served at regular intervals by (different forms of) transport ensures that the building is accessible and means that the number of people arriving in motorised private transportation can be reduced.
- The building's contribution is evaluated by assessing the accessibility of passenger information, routing and signposting.

Indicator 3: Cyclists

- The situation is similar for the cycle path network: It should allow for access from outside the region, be separate from vehicular traffic and be continuous as far as possible.
- The building's contribution is evaluated based on the access route: The evaluation examines whether there is an access route directly to the building/bicycle parking facilities that is easy to cycle along.

Indicator 4: Pedestrian traffic

- The mobility infrastructure elements should be designed so as to encourage people to travel on foot. These include a fully developed pedestrian path network, safe crossing possibilities that take the most direct route where possible, and signage displaying directions.

Indicator 5: Barrier-free design of bus stops

- Using barrier-free design for the adjacent public transport stops and for access to the building and areas in the immediate vicinity ensures that the travel to and from the building is easy for everyone.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

DESCRIPTION	SHORT CODE
Documentation of the (planned) stops on an overall plan with mapping of the distances and, if necessary, photos	A
Description and calculation of the service frequency of the individual stops and routes; the service frequency must be proved by means of suitable documents (e.g. timetables); alternatively, documents from transport companies/operators on the planned service frequency	B
Documentation of the stops on an overall plan with meaningful photos which demonstrate the quality of the individual stops	C
Overall site plan with a description of the relevant elements	D
Overall plan of the planning area showing the roads and streets	E
Proof by means of suitable planning documents	F
Proof in the form of photo documentation, clear representation in the site plan	G
Documents from transport companies/operators on planned services	H
Proof in the form of screenshots, printouts or written confirmation by the facility manager	I
Overall plan with routing and signage locations; if necessary, photo documentation of the implementation of the measures	K
Documentation of signage in the form of suitable documents (e.g. plans, photo documentation, etc.)	L
Rough estimation of journey times, or travelling times for public transport	M
Timetables	N

INDICATORS	PRE-CERTIFI-CATE	CERTIFI-CATE
1. Motorised private transportation	D, E	D, E
2. Public transport	A, B, C	A, B, C, G, H, I, M, N
3. Cyclists	D, E, F, K	D, E, F, K
4. Pedestrian traffic	D, E, F, K, L	D, E, F, K, L
5. Barrier-free design of stops	F, G	F, G
Innovation area (innovative mobility elements)	F, G	F, G

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
701	General: scheme “assembly buildings” has been added	16.09.2021
702	Evaluation: Measurement of the distance in case of obstructions	16.09.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org.
- EN 13816. Local public transport quality standard. Berlin: Beuth publisher, July 2002. https://de.scribd.com/document/324645289/En-13816-Standard-Service-Quality-Definition-Targeting-and-Measurement
- Collection of Cycle Concepts 2012, Danish Cycling Embassy, 2012. http://www.cycling-embassy.dk/wp-content/uploads/2013/12/Collection-of-Cycle-Concepts-2012.pdf

SITE1.4

Access to amenities

Objective

Our objective is to optimally cater to the day-to-day needs of the building users through the provision of easily accessible social and commercial infrastructure in the vicinity, thereby achieving social acceptance for the building. We also seek to ensure that the building is integrated into its urban context by opening up a wide range of uses to the public.

Benefits

The building users' satisfaction with the site can be increased by ensuring that there are facilities nearby that cater to their day-to-day requirements. Districts become more lively when their pavements and cycle paths are used. This also has the effect of reducing the use of motorised transportation and the associated noise pollution and harmful emissions. Furthermore, the value retention of buildings within lively districts is greater.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)	CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY
Significant	11.6 Reduce the environmental impact of cities 11.7 Provide access to safe and inclusive green and public spaces	
Moderate		11.2.b Mobility
Low		11.1.a/b/c Land use

Outlook

The weighting and evaluation are expected to remain the same.

Share of total score

	SHARE	WEIGHTING FACTOR
Office Education Residential Hotel Consumer market Shopping centre Department stores Logistics Production Assembly buildings	1.7%	3

EVALUATION

The distances between the building site and relevant social and commercial infrastructure facilities are determined and categorised as "nearby and easily accessible" if they fall within a certain radius. Measurement of the distance: If there is a sizable obstruction (river, motorway, rails, etc.) between the building and the target object, the real distance (walking/driving path) must be used. The evaluation also examines what kind of infrastructure is available for users in the building itself. Including the bonus, 110 points can be awarded for this criterion. The number of points available in indicators 1.1 and 1.2 adds up to 55; however, no more than 35 points can be awarded for the two indicators.

NO.	INDICATOR	MAX. WALKING TIME/JOURNEY TIME BY PUBLIC TRANSPORT [MIN.]	MAX. AIR-LINE DISTANCE [M]	POINTS
1	**Social infrastructure**			
1.1	**Within the district/surrounding area**			**Max. 35**
	■ **Education 1**			
	Kindergarten	-	350	+10
	■ **Education 2**			
	Higher education	15	1300	+5
	■ **Leisure**			
	For each fulfilled aspect: Art and culture (cinema, theatre, galleries), library, district centre, community centre, youth centre, senior citizens' centre, fitness studio near to the workplace, etc. (alternatively: A fitness programme that is open to the public is offered in the building and can be used by third parties)	10	700	+5
	■ **Playgrounds**	-	350	+10
	■ **Sports facilities**			
	Gymnasium and sports hall, outdoor sports /sports area with an athletics track, indoor or outdoor swimming pool	10	700	+5
1.2	**Opportunity to use rooms within the building and outdoor facilities**			**Max. 20**
1.2.1	Opportunities for facility rentals and the use of space within the building: Third parties have the opportunity to temporarily hire rooms in the building (e.g. office rooms, meeting rooms, multipurpose conference rooms, etc.). **Shopping centre** : Linkways in the building are also open to the public outside of normal business hours.			+10
1.2.2	Opportunities to use spaces in the building's outdoor facilities: The outdoor facilities surrounding the building can be used by the public both during and outside of normal business hours.			+10

NO.	INDICATOR	MAX. WALKING TIME/JOURNEY TIME BY PUBLIC TRANSPORT [MIN.]	MAX. AIR-LINE DISTANCE	POINTS
2	**Commercial infrastructure**			
2.1	**Within the district/surrounding area**			**Max. 35**
	■ **Local supply 1** Full-range supplier (supply of everyday goods)	10	700	+15
	■ **Local supply 2** Small retail outlets (bakery, butcher, drug store, etc.)	10	700	+5
	■ **Local supply 3** Weekly market	10	700	+5
	■ **Food and catering** Restaurant, café, bakery, etc.	10	700	+5
	■ **Other services** Bank, post office, hairdresser, fitness studio, wellness facilities, etc.	10	700	+5
	■ **Medical services 1** General practitioner	10	700	+10
	■ **Medical services 2** Specialists, pharmacy, etc.	10	700	+5
3	**Infrastructure associated with the building/variety of uses**			
3.1	**Variety of uses within the building** Infrastructure listed under 1.1 or 2.1 in the building itself ■ Points as in 1.1 or 2.1			**Max. 30**
3.2	**CIRCULAR ECONOMY BONUS – FACILITIES THAT CATER TO PEOPLE'S DAY-TO-DAY NEEDS AND PROVIDE MEETING POINTS FOR INTERACTION** Explanation: Bonus points can be awarded if amenities or provisions are not part of the standard requirements but have been provided or built for the building's users and third parties, such as allotment gardens and beehives (urban farming), or trading skills or services, for example, with others in the community is encouraged (by means of temporary trading spaces/pop-up shop premises, repair cafés, community meeting places, etc.).			**+10**

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The number of social and commercial infrastructure facilities in the vicinity determined in indicators 1 and 2 is a good key performance indicator (KPI) to report. The number of social and commercial facilities/amenities in the building itself is also a useful KPI to report.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Number of nearby social infrastructure facilities	[number]
KPI 2	Number of nearby commercial infrastructure facilities	[number]
KPI 3	Number of social or commercial infrastructure facilities in the building itself	[number]

Synergies with DGNB system applications

- **DGNB DISTRICT:** Indicators 1 and 2 have parallels to the content of criterion SOC3.3 from the schemes for urban districts and business districts.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

If a building and its surrounding area offer varied uses for the public, this fosters communication, a sense of community and, in turn, general acceptance of the building.

II. Additional explanation

It should be possible for the property's users to have their recreational needs, day-to-day needs, educational needs, etc. met within a relatively limited radius (compact city concept). Having an adequate supply of infrastructure in place encourages people to undertake everyday journeys on foot or by bicycle, for example.
The more open a building is to its environment and the people around it, the better its accessibility will be rated. Measures that could be used to increase accessibility include open spaces around the building that can be used by the public, cafeterias or rooms that are available for rental to third parties (office units, conference rooms, auditoriums, sports facilities, etc.). Opening the building up in this way allows the building to be used more extensively and for a longer period than when it is just used for its actual function during its normal operating hours.

III. Method

This method is a quantitative method in which graphics must be used to determine whether the property is located within the catchment area of the infrastructure facility in question. The facilities should be accessible to the general public – for sports facilities, for example, through membership of a club or similar (purely educational or business facilities are not to be evaluated).

The following indicators are evaluated:

Indicator 1: Social infrastructure
The social infrastructure is divided into infrastructure for education, leisure and playgrounds/sports facilities.

Indicator 2: Commercial infrastructure
The commercial infrastructure is divided into local supply infrastructure, medical services and other services.
Pedestrian accessibility of all infrastructure facilities is generally desirable, but cannot always be attained in reality. Accessibility of an infrastructure facility using public transport is therefore also included in the evaluation. This means that a property that has good public transport links can still benefit from facilities further afield.

Indicator 3: Infrastructure associated with the building/variety of uses
A building with a variety of uses is one that offers as many different uses as possible in addition to its actual use, such as rental of spaces to third parties or other uses such as a canteen, exhibitions, library, services. The ground floor area is a focal point since it is particularly well suited for public use (accessibility, visibility, urban design function). It can be combined with the adjacent storeys. The building's outdoor area (e.g. restaurant with outdoor seating area, street furniture) also helps to stimulate the urban environment.

IV. Usage-specific description

Depending on the scheme, different indicators can be used; the relevance of each of these indicators must then be explained.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible evidence include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements.

DESCRIPTION	SHORT CODE
Plausible declaration of intent that infrastructure will be implemented in the property/surrounding area	A
Photos of the implemented measures (and localisation in the overall plan)	B
Urban design concept including use and open space concept, which must be continually updated and deals with the content specified in the indicator. Identification of all planned infrastructure facilities in the surrounding area/district.	C
Site plan with mapping of the maximum permitted distance for each use category. Identification of all planned infrastructure facilities in the surrounding area/district and existing infrastructure facilities in the surrounding area.	D
Depending on the property: Excerpt from the written text and drawings defining the specifications for the rooms in the building that are available for rental to third parties, which clearly contain the following information: ■ Location of the rooms available for hire (floor plans) ■ Information on the rooms' function, accessibility, opening times, etc.	E
Depending on the property: Excerpt from the written text and drawings defining the range of uses available to the public in the building, which clearly contains the following information: ■ Location of the uses available to the public (floor plans) ■ Infrastructure/integration of the outdoor facilities associated with the uses (site plan) ■ Description of the type of uses available to the public, with information on accessibility, opening times, etc. ■ Tenancy agreements ■ Photo documentation	F

INDICATORS	PRE-CERTIFICATE	CERTIFICATE
1. Social infrastructure	A, C	B, C, D, E, F
2. Commercial infrastructure	A, C	B, C, D, E, F
3. Infrastructure associated with the building/variety of uses	A, C	B, C, D, E, F

APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

PAGE	EXPLANATION	DATE
712	General: scheme “assembly buildings” has been added	16.09.2021
713	Evaluation: Measurement of the distance in case of obstructions1	16.09.2021

II. Literature

- German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) (ed.) (2007): LEIPZIG CHARTA zur nachhaltigen europäischen Stadt [Leipzig Charter on Sustainable European Cities]. https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Nationale_Stadtentwicklung/leipzig_charta_en_bf.pdf
- Sustainable Development Goals icons, United Nations/globalgoals.org.